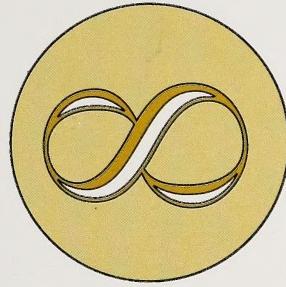


MATHEMATICS

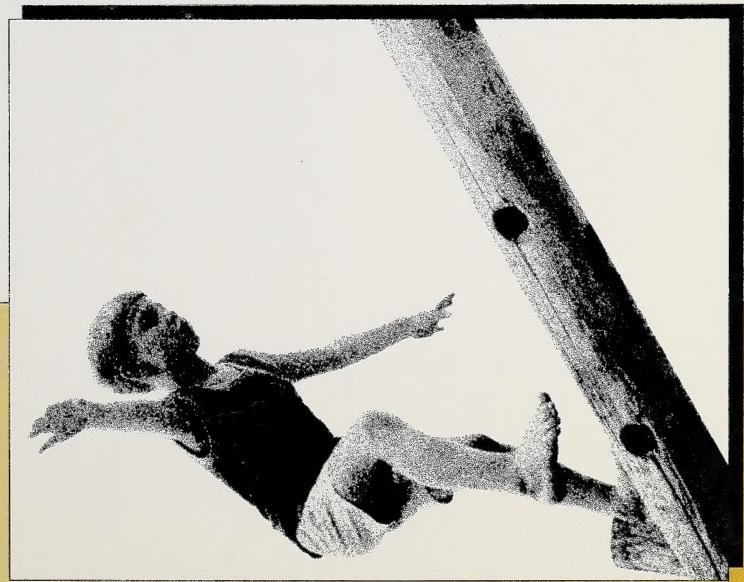
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MODULE 4

ALGEBRA



STUDENT SUPPORT GUIDE

Alberia
EDUCATION





STUDENT SUPPORT GUIDE

Module 4: Algebra

Mathematics 8

Note

This Mathematics Learning Facilitator's Manual contains answers to teacher-assessed assignments and the final test; therefore, it should be kept secure by the teacher. Student's should not have access to these assignments or the final test until they are assigned in a supervised situation. The answers should be stored securely by the teacher at all times.

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Module 4
Algebra
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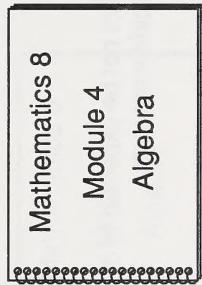
MODULE INTRODUCTION

What Lies Ahead

In the Module Introduction you will preview the module and learn how the module will be evaluated.

Gathering Materials

For this section the student will need these items.



Guiding the Student

- Emphasize to the students that the goal is to preview the module.

- Discuss the learning process, time management, and evaluation with the students. See the following suggestions.

The Learning Process

Each section of Module 4 deals with a different skill involving algebra.

Sections have several activities.

- Introductory Activities
 - Practice Activities
 - Extra Practice
 - Concluding Activities
- Remind the students that they will not be expected to do all the activities. You will help them decide what to do.

Time Management

Decide how long the student will need to complete the module. (The average student should spend about 7 weeks in a 40-week year to complete the module. It is recommended that students spend no more than 1 hour at a time doing mathematics.)

Evaluation

Explain that the grade on **Module 4** is based on work in the assignment booklet. The module booklet will help prepare students for the assignment booklet.

GETTING SET

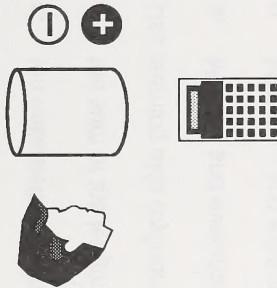
What Lies Ahead

This section will pretest the following skills.

- using variables in an algebraic expression
- evaluating expressions for a given value of the variable
- simplifying algebraic expressions by combining like terms
- using variables to write mathematical expressions and sentences
- solving equations using additive inverses
- solving equations using multiplicative inverses
- solving equations using additive and multiplicative inverses
- generating a set of ordered pairs
- plotting ordered pairs
- producing a graph
- describing relations

Gathering Materials

For this section the student will need these items.



Guiding the Student

- Emphasize to the students that the goal of this section is to discover their strengths and weaknesses.

- Help the students check their answers to the pretest. It is not necessary to correct any errors at this time. See the last page of this section for further directions.

Pretest**Suggested Answers**

1. Translate each English phrase into a mathematical expression.
 - a. five times Sam's age
 - b. Helen's mass decreased by two kilograms
 - c. the distance from John's house to work divided by two
 - d. ten dollars more than Ruth's wage
 - e. the sum of the length and width of the house
 2. Use learning aids (cylinders and counters) to do the following.
 - a. Model x and evaluate if $x = -1$.
 - b. Model $-x$ and evaluate if $x = -1$.
 - c. Model $x + 2$ and evaluate if $x = -1$.
 - d. Model $x + y$ and evaluate if $x = -1$ and $y = +1$.
 - e. Model $x + xy$ and evaluate if $x = -1$ and $y = +1$.
1. a. $5 \times a$ or $5a$
 - b. $m - 2$
 - c. $d + 2$ or $\frac{d}{2}$
 - d. $w + 10$
 - e. $l + w$
2. Modelling is shown at the end of this section.
- a. -1
 - b. $+1$
 - c. $+1$
 - d. 0
 - e. -2

3. Use paper and pencil methods to evaluate the following expressions.

- a. $2a + 7$ if $a = 3$
b. $n^2 - 2$ if $n = -5$
c. $e - 3d$ if $d = 2$ and $e = -2$
d. $3y + z$ if $y = \frac{1}{3}$ and $z = \frac{1}{2}$
4. Use learning aids (cylinders and counters) to model and simplify the following expressions.
- a. $t + t + t + t$
b. $s + 2 - 3 + 1$
c. $a + 2 + a - 5$
d. $a + b - 3 + a$
e. $b + c - 1 - b$
5. Use paper and pencil methods to simplify the following expressions.
- a. $3f - 1 + 2 - f$
b. $2a + 3ab + a - b$
c. $-cd + 3c^2 + cd - d$
d. $2a - 2 + 5a$
4. Modelling is shown at the end of this section.
- a. 13
b. 23
c. -8
d. $1\frac{1}{2}$
- a. $4t$
b. s
c. $2a - 3$
d. $2 + b - 3$
e. $c - 1$
- a. $2f + 1$
b. $3a + 3ab - b$
c. $3c^2 - d$
d. $7a - 2$

6. Translate the following sentences into equations.
- a. Two times a number plus three results in thirteen.
- b. Linton's age is six less than Evon's.
- c. Katsuta's mass increased by 10 kg is the same as Hayanu's.
- d. The length of the building squared is five less than the width of the building.
7. Model the following equations. Then solve the equations using inspection or guess-check-revise methods. Verify the solutions.
- a. $x + 2 = 8$
- b. $3d = 12$
- c. $2m - 1 = 7$
- d. $5n = 2n - 9$
- e. $2y + 3 = y - 1$
6. a. $2n + 3 = 13$
- b. $e - 6 = \ell$
- c. $k + 10 = h$
- d. $\ell^2 = w - 5$
7. Modelling is shown at the end of this section.

8. Solve the following equations using inspection or guess-check-revise methods. Verify using paper and pencil methods.

- a. $3w + 2 = 11$
- b. $5x + 1 = 3x - 9$

9. Solve $x + 3 = 8$ using additive inverses. Verify the solution.

- a. Use models.
- b. Use paper and pencil methods.

10. Solve $3y = -12$ using multiplicative inverses. Verify the solution.

- a. Use models.
- b. Use paper and pencil methods.

11. Solve the following using paper and pencil methods. Verify the solutions.

- a. $\frac{r}{3} = 5$
- b. $\frac{n}{2} = \frac{7}{8}$

12. Solve $3d + 5 = 11$ using inverses. Verify the solution.

- a. Use models.
- b. Use paper and pencil methods.

8. a. $w = 3$

b. $x = -5$

9. a. Modelling is shown at the end of this section.

b.
$$\begin{array}{rcl} x + 3 & = & 8 \\ -3 & & -3 \\ \hline x & = & 5 \end{array}$$

10. a. Modelling is shown at the end of this section.

b.
$$\begin{array}{rcl} \frac{1}{3} \times 3y & = & \frac{1}{3} \times (-12) \\ y & = & -4 \end{array}$$

11. a. $r = 15$

b. $n = 1\frac{3}{4}$

12. a. Modelling is shown at the end of this section.

b.
$$\begin{array}{rcl} 3d + 5 & = & 11 \\ -5 & & -5 \\ \hline 3d & = & 6 \end{array}$$

$\frac{1}{3} \times 3d = \frac{1}{3} \times 6$

$d = 2$

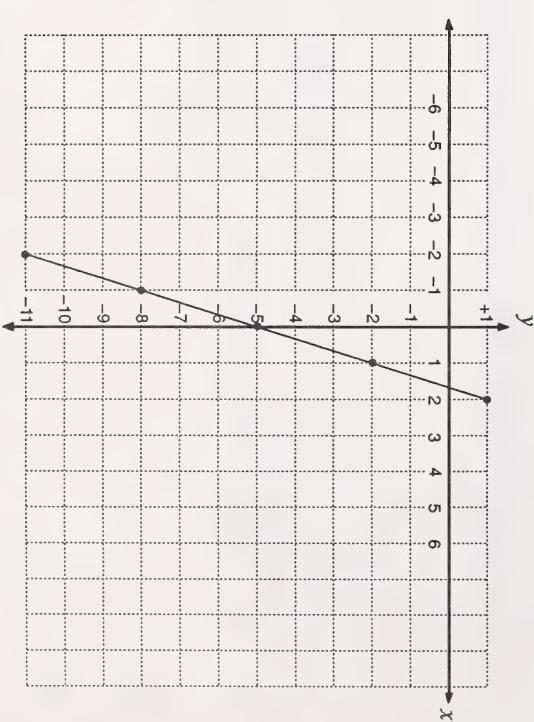
13. Complete the following table of values.

$y = 3x - 5$	
x	y
-2	
-1	
0	
1	
2	

14. Graph $y = 3x - 5$.

$y = 3x - 5$	
x	y
-2	-11
-1	-8
0	-5
1	-2
2	1

14.



15. Jerrit unpacks cans from boxes at a grocery store.

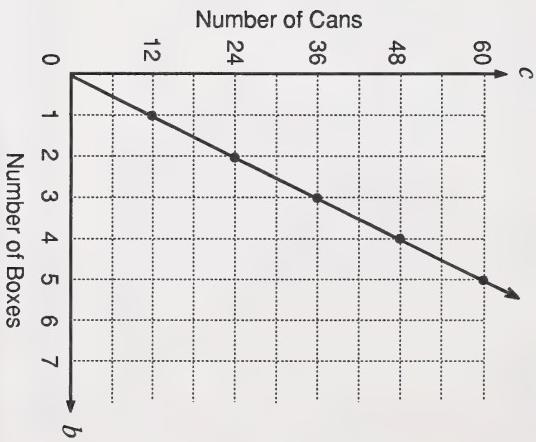
Number of Boxes (<i>b</i>)	Relation	Number of Cans (<i>c</i>)
1	12×1	12
2	12×2	24
3	12×3	36
4	12×4	48
5	12×5	60

15. a. The number of cans is twelve times the number of boxes.
- b. $c = 12b$
- c. $(1, 12), (2, 24), (3, 36), (4, 48), (5, 60), \dots$

- a. Use words to describe the relationship.
- b. Write an equation to describe the relationship.
- c. Use ordered pairs to describe the relationship.

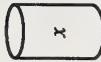
- d. Use a graph to describe the relationship.

d.



Modelling

2. a. Model
- x
- .

Evaluate if $x = -1$.

The value of the expression is -1 .

- d. Model
- $x + y$
- .

Evaluate if $x = -1$ and $y = +1$.

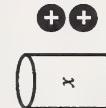
The value of the expression is 0 .

- b. Model
- $-x$
- .

Evaluate if $x = -1$.

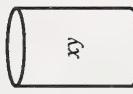
$-x$ is opposite of x .

- c. Model
- $x + 2$
- .

Evaluate if $x = -1$.

The value of the expression is $+1$.

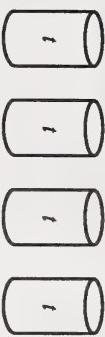
- e. Model
- $x + xy$
- .

Evaluate if $x = -1$ and $y = +1$.

If $x = -1$ and $y = +1$, $xy = (-1) \times (+1)$ or -1 .

The value of the expression is -2 .

4. a. Model $t + t + t + t$.



This expression can be called $4t$.

- b. Model $s + 2 - 3 + 1$



Remove the zero pairs.



This expression is s .

- c. Model $a + 2 + a - 5$.

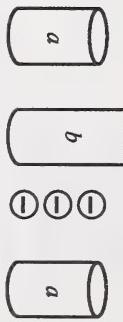


Group the cylinders labelled a .



This expression is $2a - 3$.

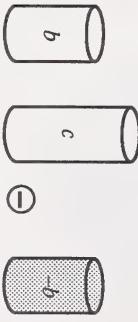
- d. Model $a + b - 3 + a$.



Group the cylinders labelled a .

- This expression is $2a + b - 3$.

- e. Model $b + c - 1 - b$.

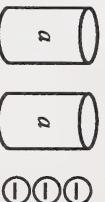


Remove the zero pairs.



The expression is $c - 1$.

Remove the zero pairs.



This expression is $2a - 3$.

7. a. Model $x + 2 = 8$.

$$\begin{array}{c} \text{LS} = \text{RS} \\ \text{Model } x + 2 = 8. \\ \text{Verify } x = +6. \end{array}$$

$$\text{Verify } x = +6.$$

$$\begin{array}{c} \text{LS} = \text{RS} \\ \text{Model } 3d = 12. \\ \text{Verify } d = +4. \end{array}$$

$$\text{Verify } d = +4.$$

- b. Model $2m - 1 = 7$.

$$\begin{array}{c} \text{LS} = \text{RS} \\ \text{Model } m + 2 = 4. \\ \text{Verify } m = +4. \end{array}$$

$$\text{Verify } m = +4.$$

$$\begin{array}{c} \text{LS} = \text{RS} \\ \text{Model } 5n = 2n - 9. \\ \text{Verify } n = -3. \end{array}$$

$$\text{Verify } n = -3.$$

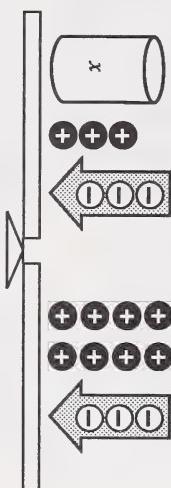
$$\begin{array}{c} \text{LS} = \text{RS} \\ \text{Model } 2y + 3 = y - 1. \\ \text{Verify } y = -4. \end{array}$$

$$\begin{array}{c} \text{LS} = \text{RS} \\ \text{Model } 2m - 1 = 7. \\ \text{Verify } m = 4. \end{array}$$

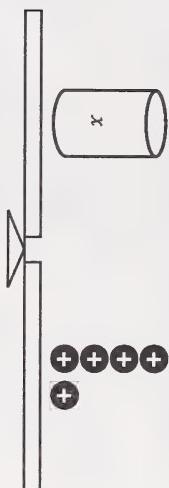
9. a. Model $x + 3 = 8$.



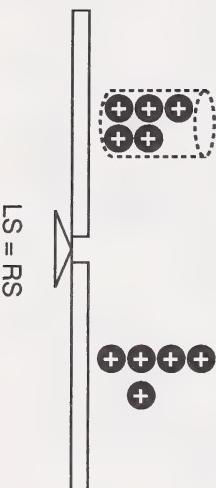
Add -3 to both sides.



Remove the zero pairs.

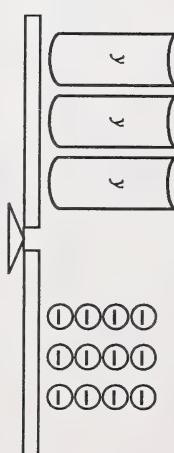


Verify $x = +5$.

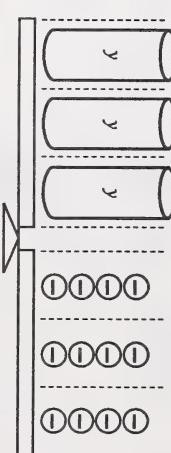


$\text{LS} = \text{RS}$

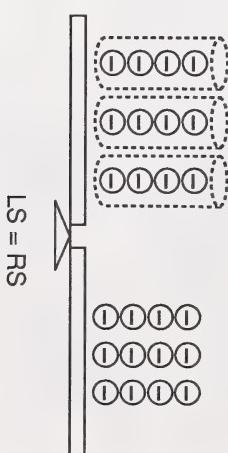
10. a. Model $3y = -12$.



Divide each side into 3 groups.



Verify $y = -4$.

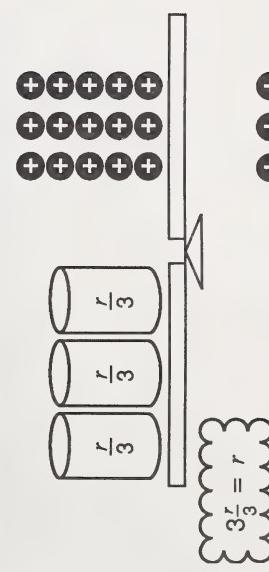


$\text{LS} = \text{RS}$

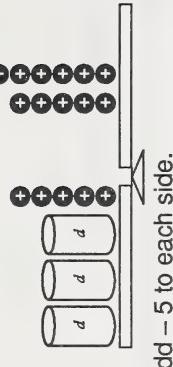
11. a. Model $\frac{r}{3} = 5$.



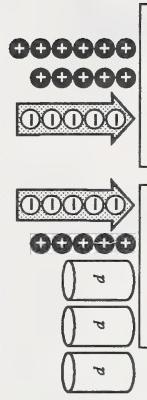
Multiply each side by 3.



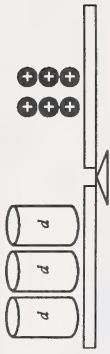
12. a. Model $3d + 5 = 11$.



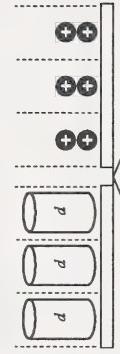
Add -5 to each side.



Remove the zero pairs.



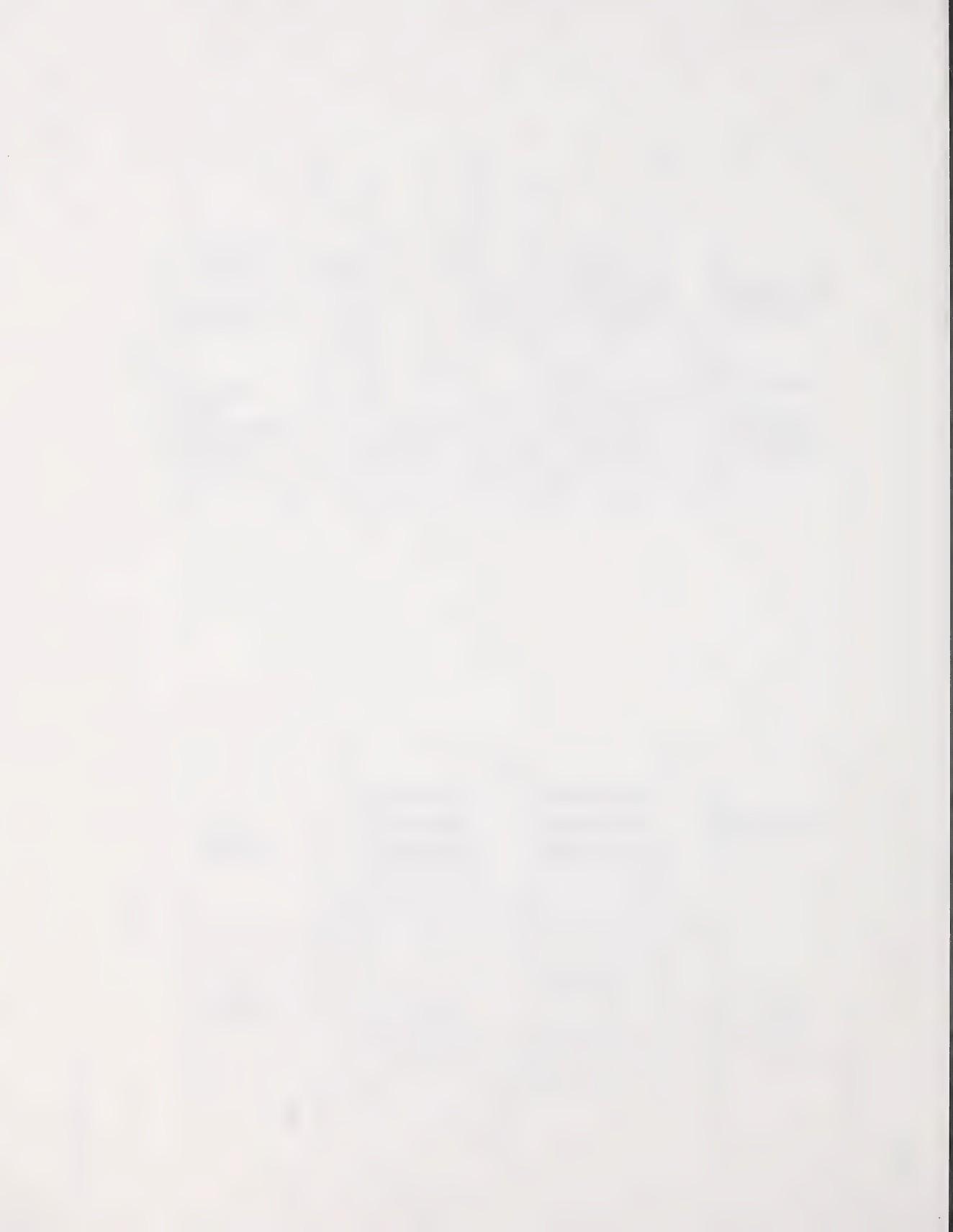
Divide each side by 3.



Verify $d = 5$.



LS = RS



TRANSLATING WORDS AND PHRASES

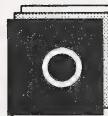
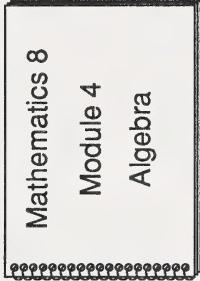
What Lies Ahead

In this section the student will learn these skills.

- translating English phrases into mathematical expressions
- interpreting the meaning of variables and algebraic expressions

Gathering Materials

For this section the student will need these items.



(optional)

Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students decide what to do in this section.

- Help the students check their answers to the activities in this section and correct any errors.

Introductory Activities

Translate each English phrase into a mathematical expression

1. seven baseballs increased by nine baseballs 1. $7 + 9$
2. the difference between nine poodles and six poodles 2. $9 - 6$
3. five groups of fifteen children 3. 5×15
4. forty-eight pizzas divided by sixteen people 4. $48 \div 16$
5. three more than the difference of five years and two years 5. $3 + 5 - 2$
6. thirty-two tapes decreased by eight groups of three tapes 6. $32 - 8 \times 3$

Suggested Answers

Practice Activities**Suggested Answers**

1. Translate the following English expressions into mathematical expressions containing variables.

a. the sum of a number and three

b. three subtracted from a number

c. two thirds of a number

d. a number squared

e. five more than a number

f. twice a number increased by six

g. one less than two thirds of a number

h. four more than one half of a number

i. the difference between eight and a number cubed

1. a. $n + 3$

b. $n - 3$

c. $\frac{2}{3}n$

d. n^2

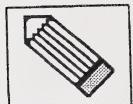
e. $n + 5$

f. $2n + 6$

g. $\frac{2}{3}n - 1$

h. $\frac{1}{2}n + 4$

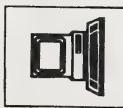
i. $8 - n^3$

Print Alternative

2. Translate the following situations into mathematical phrases.
- a. Marco's age increased by two years 2. a. $a + 2$
- b. twice the distance from Muriel's house to school b. $2d$
- c. a number squared c. n^2
- d. five times the price of a car d. $5p$
- e. twice Amar's salary plus three dollars e. $2s + 3$
- f. one half of the price f. $\frac{1}{2}p$
- g. a boy's age twelve years from now g. $a + 12$
- h. the sum of Ardith's mass and twenty-five kilograms h. $m + 25$

Computer Alternative

3. Do Introductory Lesson 1 of *BRI/TANNICA: Problem Solving in Algebra.*



Concluding Activities**Suggested Answers**

1. Read the following phrases aloud.
 - a. three times four, less two
 - b. three times, four less two
 - c. the sum of two, and five times three
 - d. the sum of two and five, times three

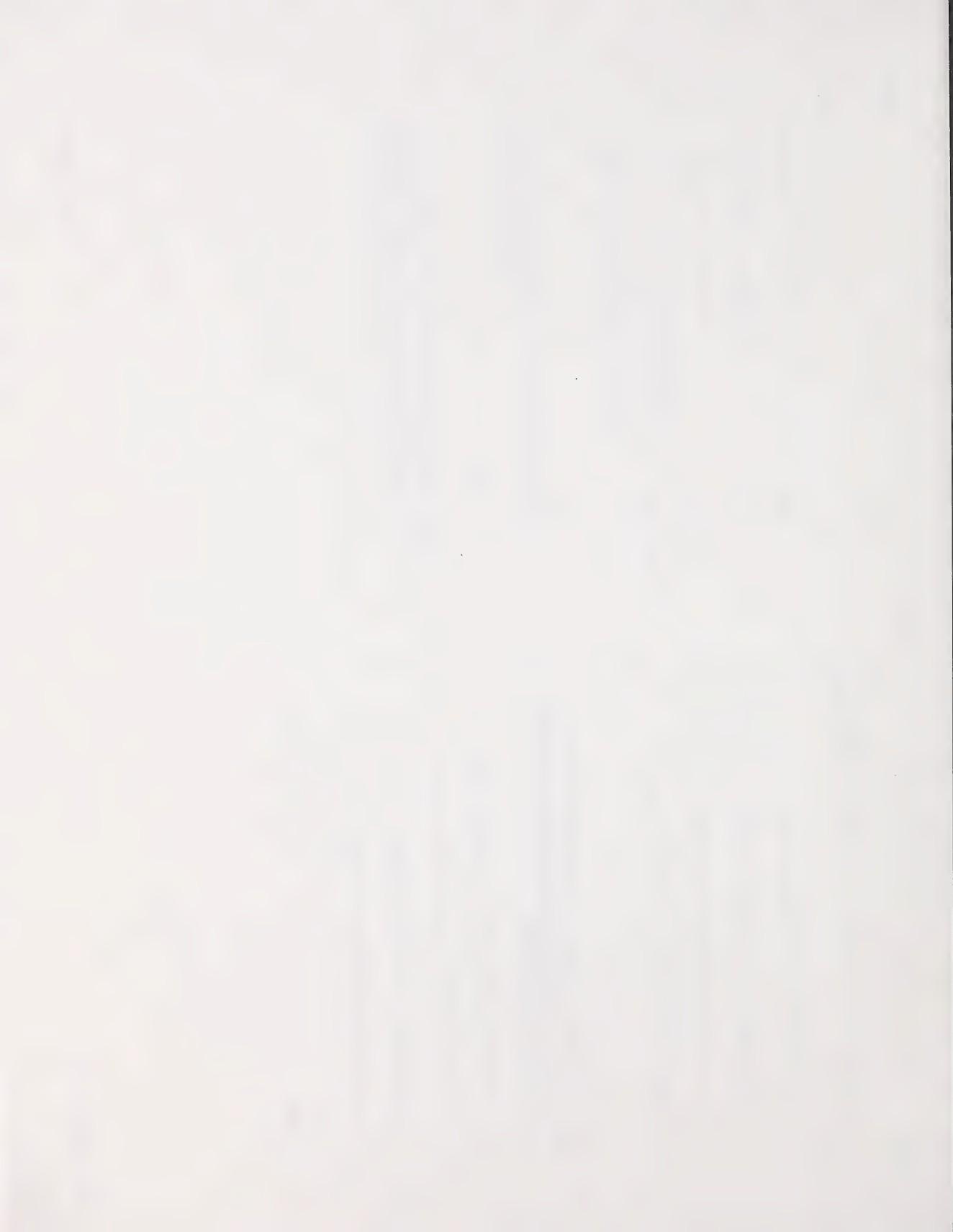
2. How did you translate the commas when you read the phrases in Question 1?
 2. The commas were translated as pauses.

3. Mathematicians sometimes use brackets to show order of operations. Translate the expressions in Question 1 into mathematical expressions containing brackets.
 3. a. $(3 \times 4) - 2$
 - b. $3 \times (4 - 2)$
 - c. $2 + (5 \times 3)$
 - d. $3 \times (2 + 5)$

4. Translate the following English expressions into algebraic expressions.

- a. sixteen times, two more than a number
- b. sixteen times two, more than a number
- c. four times the length, plus eight centimetres
- d. four times, the length plus eight centimetres

4. a. $16(2 + n)$
- b. $(16 \times 2) + n$
- c. $4\ell + 8$
- d. $4(\ell + 8)$ or $4 \times (\ell + 8)$
5. Remember that subtraction is sometimes translated in a different order. Translate the following English expressions into mathematical expressions.
- a. the difference of three, and two times a number
 - b. the difference of three and two, times a number
 - c. four less than three, times a number
 - d. four less than, three times a number



EVALUATING ALGEBRAIC EXPRESSIONS

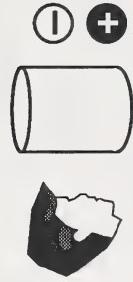
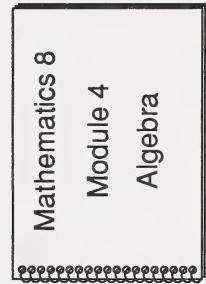
What Lies Ahead

In this section the student will learn these skills.

- modelling algebraic expressions
- evaluating algebraic expressions using models
- evaluating algebraic expressions using paper and pencil methods

Gathering Materials

For this section the student will need these items.



Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students decide what to do in this section.
- Help the students check their answers to the activities in this section and correct any errors.

Introductory Activities

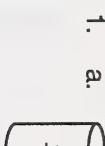
1. a. Model $x + 5$.
b. Evaluate $x + 5$ if $x = +3$.
c. Evaluate $x + 5$ if $x = -2$.

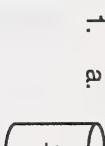
2. a. Model $3 - y$.
b. Evaluate $3 - y$ if $y = +4$.
c. Evaluate $3 - y$ if $y = -1$.

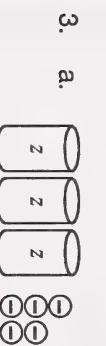
3. a. Model $3z - 5$.
b. Evaluate $3z - 5$ if $z = -2$.
c. Evaluate $3z - 5$ if $z = +3$.

4. a. Model $a + 2b$.
b. Evaluate $a + 2b$ if $a = -1$ and $b = +3$.
c. Evaluate $a + 2b$ if $a = +2$ and $b = -2$.

Suggested Answers

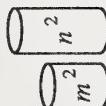
1. a. 
b. 
c. +3

2. a. 
b. -1
c. +4

3. a. 
b. -11
c. +4

4. a. 
b. +5
c. -2

5. a. Model $m^2 + n^2$.
b. Evaluate $m^2 + n^2$ if $m = +2$ and $n = +3$.
c. Evaluate $m^2 + n^2$ if $m = -1$ and $n = 0$.



5. a. Model $m^2 + n^2$.

b. Evaluate $m^2 + n^2$ if $m = +2$ and $n = +3$.

c. Evaluate $m^2 + n^2$ if $m = -1$ and $n = 0$.

5. a. Model $m^2 + n^2$.

b. Evaluate $m^2 + n^2$ if $m = +2$ and $n = +3$.

- c. Evaluate $m^2 + n^2$ if $m = -1$ and $n = 0$.

6. a. Model $r + 2rs$.

b. Evaluate $r + 2rs$ if $r = -1$ and $s = +2$.

c. Evaluate $r + 2rs$ if $r = +3$ and $s = -1$.

6. a. Model $r + 2rs$.

b. Evaluate $r + 2rs$ if $r = -1$ and $s = +2$.

c. Evaluate $r + 2rs$ if $r = +3$ and $s = -1$.

7. a. Model $3(a - 5)$.

b. Evaluate $3(a - 5)$ if $a = +1$.

c. Evaluate $3(a - 5)$ if $a = -1$.

7. a. Model $3(a - 5)$.

b. Evaluate $3(a - 5)$ if $a = +1$.

c. Evaluate $3(a - 5)$ if $a = -1$.

7. a. Model $3(a - 5)$.

b. Evaluate $3(a - 5)$ if $a = +1$.

c. Evaluate $3(a - 5)$ if $a = -1$.

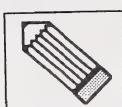
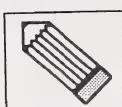
Practice Activities**Computer Alternative**

1. Do Lesson 5 of the *Pre-Algebra* disk from the package *Computer Drill and Instruction: Mathematics, Level D* (SRA).

Remember, if you need help, press the SHIFT key and the  key.

Print Alternative

2. a. Evaluate $n + 10$ if $n = 8$.

2. a. 18

b. Evaluate $2p$ if $p = 0.6$.

b. 1.2
c. 1
c. 1

Suggested Answers

1. Computer corrected

d. Evaluate $3 + 4s$ if $s = 0.5$.

d. 5

e. Evaluate $2n^2 + 1$ if $n = 4$.

e. 33

f. Evaluate $0.5n - 0.1$ if $n = 2$.

f. 0.9

Concluding Activities

1. Complete the following tables. Evaluate the first three values and then use a pattern to help you find the last three values.

a.

a	$a + 2$
1	
2	
3	
4	
5	
6	

b.

b	$4b - 1$
1	
2	
3	
4	
5	
6	

b.

b	$4b - 1$	Pattern
1	3	
2	7	{ } + 4
3	11	{ } { } + 4
4	15	{ } { } { } + 4
5	19	{ } { } { } { } + 4
6	23	{ } { } { } { } { } + 4

Suggested Answers

a.

a	$a + 2$	Pattern
1	3	{ } + 1
2	4	{ } { } + 1
3	5	{ } { } { } + 1
4	6	{ } { } { } { } + 1
5	7	{ } { } { } { } { } + 1
6	8	{ } { } { } { } { } { } + 1

c.	c	$2c$
1		
2		
3		
4		
5		
6		

c.	c	$2c$	Pattern
1	1	2	{ +2 }
2	2	4	{ +2 }
3	3	6	{ +2 }
4	4	8	{ +2 }
5	5	10	{ +2 }
6	6	12	

d.	d	$3d + 2$
1	1	5
2	2	8
3	3	11
4	4	14
5	5	17
6	6	20

d.	d	$3d + 2$	Pattern
1	1	5	{ +3 }
2	2	8	{ +3 }
3	3	11	{ +3 }
4	4	14	{ +3 }
5	5	17	{ +3 }
6	6	20	

e.	f	$5f - 1$
1		
2		
3		
4		
5		
6		

e.	f	$5f - 1$	Pattern
1	4		
2	9		$\{ + 5$
3	14		$\} + 5$
4	19		$\{ + 5$
5	24		$\} + 5$
6	29		$\} + 5$

2. How are the patterns in Question 1 similar to the algebraic expressions?
Hint: $a + 2 = 1a + 2$.
3. Each of the following algebraic expressions has a missing number shown by . Use the table of values to find each value of .

a.	k	$k - 3$
1	1	
2	5	
3	9	
4	13	

3. a.	k	$k - 3$	Pattern
1	1		
2	5		$\{ + 4$
3	9		$\} + 4$
4	13		$\} + 4$

So, using the pattern,
 = 4.

b.	y	$\blacksquare y + 1$
1	7	
2	13	
3	19	
4	25	

b.	y	$\blacksquare y + 1$	Pattern
1	7		$\left\{ \begin{array}{l} +6 \\ +6 \\ +6 \end{array} \right\}$
2	13		$\left\{ \begin{array}{l} +6 \\ +6 \\ +6 \end{array} \right\}$
3	19		$\left\{ \begin{array}{l} +6 \\ +6 \\ +6 \end{array} \right\}$
4	25		$\left\{ \begin{array}{l} +6 \\ +6 \\ +6 \end{array} \right\}$

So, using the pattern,
 $\blacksquare = 6$.

c.	d	$\blacksquare d - 1$
1	1	
2	3	
3	5	
4	7	

c.	d	$\blacksquare d - 1$	Pattern
1	1	1	$\left\{ \begin{array}{l} +2 \\ +2 \\ +2 \end{array} \right\}$
2	3	3	$\left\{ \begin{array}{l} +2 \\ +2 \\ +2 \end{array} \right\}$
3	5	5	$\left\{ \begin{array}{l} +2 \\ +2 \\ +2 \end{array} \right\}$
4	7	7	$\left\{ \begin{array}{l} +2 \\ +2 \\ +2 \end{array} \right\}$

So, using the pattern,
 $\blacksquare = 2$.

d.	x	$\blacksquare x + 4$
1	7	
2	10	
3	13	
4	16	

d.	x	$\blacksquare x + 4$	Pattern
1	7	7	$\left\{ \begin{array}{l} +3 \\ +3 \\ +3 \end{array} \right\}$
2	10	10	$\left\{ \begin{array}{l} +3 \\ +3 \\ +3 \end{array} \right\}$
3	13	13	$\left\{ \begin{array}{l} +3 \\ +3 \\ +3 \end{array} \right\}$
4	16	16	$\left\{ \begin{array}{l} +3 \\ +3 \\ +3 \end{array} \right\}$

So, using the pattern,
 $\blacksquare = 3$.

4. Complete the following tables. Evaluate the first three variables and then use a pattern to help you find the last three values.

a.

a	a^2
1	
2	
3	
4	
5	
6	

b.

b	$b^2 + 3$
1	
2	
3	
4	
5	
6	

4. a.

a	a^2	Pattern
1	1	
2	4	{ +3 }
3	9	{ +5 }
4	16	{ +7 }
5	25	{ +9 }
6	36	{ +11 }

b.

b	$b^2 + 3$	Pattern
1	4	{ +3 }
2	7	{ +5 }
3	12	{ +2 }
4	19	{ +7 }
5	28	{ +2 }
6	39	{ +11 }

c.	c	$c^2 - 1$
1		
2		
3		
4		
5		
6		

c.	c	$c^2 - 1$
1	1	0
2	2	3
3	3	8
4	4	15
5	5	24
6	6	35

5. Complete the following statements.

- a. In Question 1 the exponent of each variable is _____, and you found the difference _____ to obtain the pattern. Hint: $a + 2 = a^1 + 2$ and $4b^1 - 1 = 4b^1 - 1$.
- b. In Question 4 the exponent of each variable is _____, and you found the difference _____ to obtain the pattern.
5. a. In Question 1 the exponent of each variable is 1, and you found the difference once to obtain the pattern.
- b. In Question 4 the exponent of each variable is 2, and you found the difference twice to obtain the pattern.

6. Each of the following algebraic expressions has the exponent of the variable missing. Use the table of values to find the missing exponent.

a.	a	$a \blacksquare + 1$
1	2	
2	5	
3	10	
4	17	

a.	a	$a \blacksquare + 1$	Pattern
1	2		
2	5		+3
3	10		+5
4	17		+7

The difference was found twice, so $\blacksquare = 2$ and
 $a \blacksquare + 1 = a^2 + 1$.

b.	$b \blacksquare - 1$	Pattern
1	0	
2	1	+1
3	2	+1
4	3	+1

b.	$b \blacksquare - 1$
1	0
2	1
3	2
4	3

The difference was found once, so $\blacksquare = 1$ and
 $b \blacksquare - 1 = b^1 - 1$, or $b - 1$.

SIMPLIFYING ALGEBRAIC EXPRESSIONS

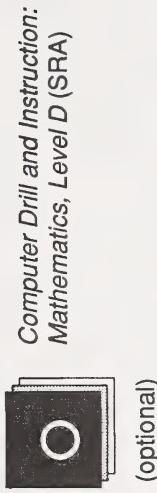
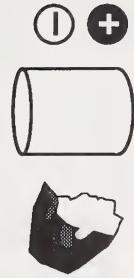
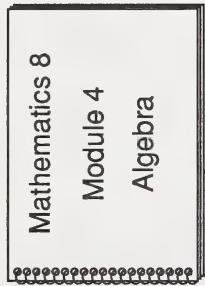
What Lies Ahead

In this section the student will learn these skills.

- identifying like terms and unlike terms
- simplifying algebraic expressions using models
- simplifying algebraic expressions using paper and pencil methods

Gathering Materials

For this section the student will need these items.



Guiding the Student

- Emphasize to the students the goal of this section.

- Help the students decide what to do in this section.

- Help the students to check their answers to the activities in this section and correct any errors.

Introductory Activities

Use models to simplify the following expressions.

1. $m + m$

2. $d + 2 + d - 4$

3. $y + y + 3 + x + 1 + x - 6 + x$

4. $a + y + a - 3$

5. $-4 + n + n + 7 - 6 + n$

6. $j + 3 + j + 3 + j + 3$

Suggested Activities

See the models on the following pages.

1. $2m$

2. $2d - 2$

3. $2y + 3x - 2$

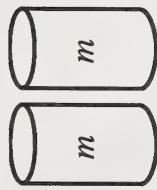
4. $2a + y - 3$

5. $3n - 3$

6. $3j + 9$

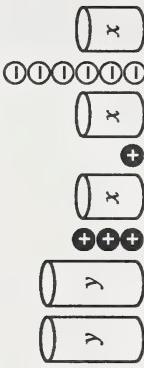
Modelling

1. Model $m + m$.

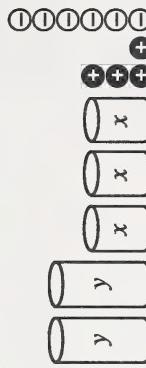


$$\text{So, } m + m = 2m.$$

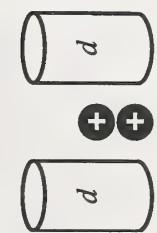
3. Model $y + y + 3 + x + 1 + x - 6 + x$.



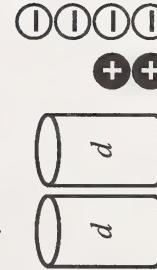
Regroup.



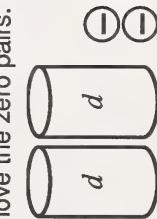
2. Model $d + 2 + d - 4$.



Regroup.

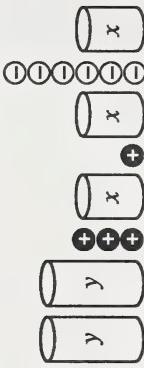


Remove the zero pairs.

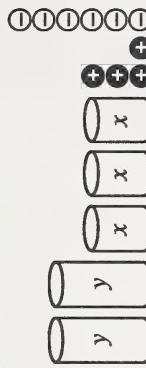


$$\text{So, } d + 2 + d - 4 = 2d - 2.$$

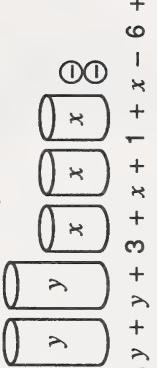
3. Model $y + y + 3 + x + 1 + x - 6 + x$.



Regroup.

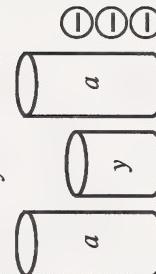


Remove the zero pairs.

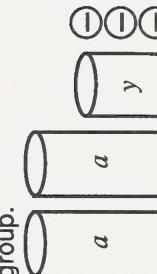
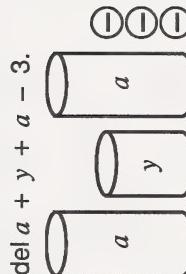


$$\text{So, } y + y + 3 + x + 1 + x - 6 + x = 2y + 3x - 2.$$

4. Model $a + y + a - 3$.

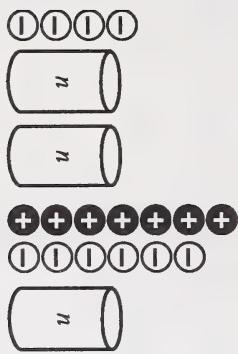


Regroup.

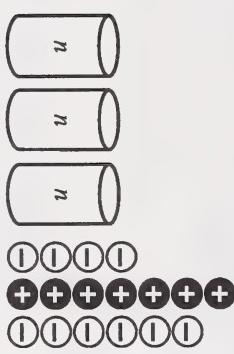


$$\text{So, } a + y + a - 3 = 2a + y - 3.$$

5. Model $-4 + n + n + 7 - 6 + n$.



Regroup.

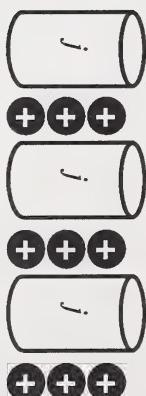


Remove the zero pairs.

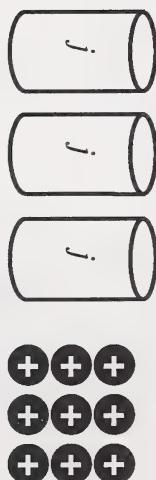


So, $-4 + n + n + 7 - 6 + n = 3n - 3$.

6. Model $j + 3 + j + 3 + j + 3$.



Regroup.



So, $j + 3 + j + 3 + j + 3 = 3j + 9$.

Practice Activities**Computer Alternative**

1. Do Lesson 9 of the *Pre-Algebra* disk from the package *Computer Drill and Instruction: Mathematics, Level D* (SRA).

Print Alternative

2. Simplify by collecting the like terms



- a. $2f + 5f$
b. $5x - 2x + 4z - 2z$
c. $3a - 2a^2 - 5a$
d. $3m - 2 + 4p + 7m + 7n - 13$
e. $2a + 3b + 2ab + 5b - 8ab$
f. $-6cd + 3c^2 + 2d^2 + cd + 4d^2$
1. Computer corrected

Extra Practice**Suggested Answers**

1. Use the words **like** and **unlike** to describe each of the following pairs.
- $3x$ and x
 - $4y$ and $4x$
 - $-2a^2$ and a
 - 8 and $\frac{1}{5}$
2. Simplify the following expressions.
- $6 + 4p - 3 - 6p$
 - $3a - a^2 + 5a - 4a^2$
 - $6a - 4ab + ab - 7a + 8a$
 - $-4p + 6n - 3n + 7p - 6p + 5n$
 - $4w - 7 + 3x + 5w + 13x - wx$

- like
 - unlike
 - unlike
 - like
- $-2p + 3$
 - $-5a^2 + 8a$
 - $7a - 3ab$
 - $8n - 3p$
 - $9w + 16x - wx - 7$

Concluding Activities

1. Which of the following expressions are equivalent?

a. $a^2 - b^2 + 2b^2 - a^2$

b. $2a^2 + 3a - 2a^2$

c. $3a - b + a + 2b$

d. $-3b + 3a + 4b - 2a$

e. $2a - b - a + 2b$

f. $6a - 8 + 3a + 5$

g. $3a + a + 4b - 3b$

h. $2ab - b^2 - 2ab + 2b^2$

i. $4a + 2b - a - 2b$

j. $a^2 + a - a^2 + 2a$

Suggested Answers

1. Expressions a. and h. are equivalent.

Expressions b., i., and j. are equivalent.

Expressions c. and g. are equivalent.

Expressions d. and e. are equivalent.

The expressions can each be simplified as shown:

a. $1b^2$

b. $3a$

c. $4a + b$

d. $a + b$

e. $a + b$

f. $9a - 3$

g. $4a + b$

h. b^2

i. $3a$

j. $3a$

2. Evaluate the following.
- $2m + 6m$, if $m = 2$
 - $5q - 2q$, if $q = 2.7$
 - $5t - 3t + 2t$, if $t = \frac{1}{4}$
 - $3f - g - f + g$, if $f = 2$ and $g = 5$
3. Collect the like terms in Question 2. Then evaluate the simplified expressions.
- $8m$, 16
 - $3q$, 8.1
 - $4t$, 1
 - $2f$, 4
4. What do you notice about the answers in Questions 2 and 3?
4. The answers in Questions 2 and 3 are the same. In other words, you can evaluate before or after simplifying an expression.

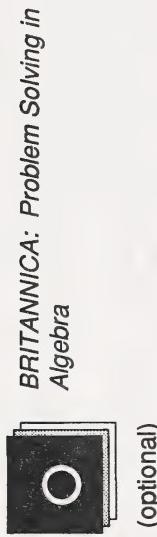
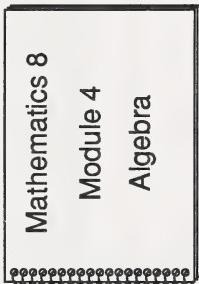
TRANSLATING SENTENCES

What Lies Ahead

In this section the student will learn this skill.
• translating English sentences into equations

Gathering Materials

For this section the student will need these items.



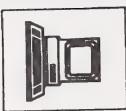
Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students decide what to do in this section.

- Help the students check their answers to the activities in this section and correct any errors.

Introductory Activities**Suggested Answers****Print Alternative**

1. Write each of the following sentences as an equation.
- Twelve decreased by a number is four.
 - The sum of the number and one half of the number is equal to forty-eight.
 - A number tripled decreased by 2 results in -7 .
 - Three kilograms more than Bob's mass is fifty-two kilograms.
 - Five dollars more than double Marnie's money is \$79.
 - Nine less than half the total number of newspapers delivered is twenty-seven newspapers.

Computer Alternative

2. Do Introductory Lessons 5 and 6 of *BRITANNICA: Problem Solving in Algebra*.

2. Computer corrected

Practice Activities

Write an equation for each of these problems.

1. Six times a number plus ten equals forty. What is the number?
1. $6n + 10 = 40, n = 5$
2. A number increased by two and a half equals seven. What is the number?
2. $n + 2\frac{1}{2} = 7, n = 4\frac{1}{2}$
3. The price of six hockey tickets plus eight dollars for refreshments equals eighty dollars. How much did each hockey ticket cost?
3. $6n + 8 = 80, n = 12$
4. Chandia used an average of six sheets of loose-leaf paper each day. At the end of the semester she had used six hundred fifty-four sheets of paper. How many days long was the semester?
4. $6n = 654, n = 109$
5. Zaib now has thirty-seven tropical fish in his aquarium. This is seven less than four times the number of fish that he had when he started his aquarium. How many tropical fish did Zaib have at the start?
5. $4n - 7 = 37, n = 11$

Suggested Answers

Write an equation for each of these problems.

1. Six times a number plus ten equals forty. What is the number?
1. $6n + 10 = 40, n = 5$
2. A number increased by two and a half equals seven. What is the number?
2. $n + 2\frac{1}{2} = 7, n = 4\frac{1}{2}$
3. The price of six hockey tickets plus eight dollars for refreshments equals eighty dollars. How much did each hockey ticket cost?
3. $6n + 8 = 80, n = 12$
4. Chandia used an average of six sheets of loose-leaf paper each day. At the end of the semester she had used six hundred fifty-four sheets of paper. How many days long was the semester?
4. $6n = 654, n = 109$
5. Zaib now has thirty-seven tropical fish in his aquarium. This is seven less than four times the number of fish that he had when he started his aquarium. How many tropical fish did Zaib have at the start?
5. $4n - 7 = 37, n = 11$

Concluding Activities

Translate the following. Use brackets where needed.

1. The square of nine, minus three, results in seventy-eight.

1. $9^2 - 3 = 78$

2. The square of, nine minus three, gives thirty-six.

2. $(9 - 3)^2 = 36$

3. The sum of eight and two, times a number is sixty.

3. $n \times (8 + 2) = 60$, $(8 + 2) \times n = 60$, $n(8 + 2) = 60$,
or $(8 + 2)n = 60$.

4. The sum of eight, and two times a number equals twenty.

4. $2n + 8 = 20$

Suggested Answers

EQUATIONS

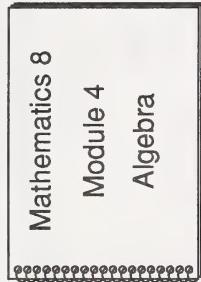
What Lies Ahead

In this section the student will learn these skills.

- modelling equations
- solving equations by inspection or by using guess-check-revise methods
- verifying solutions by modelling the equation

Gathering Materials

For this section the student will need these items.



(optional)

Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students decide what to do in this section.
- Help the students check their answers to the activities in this section and correct any errors.

Introductory Activities

1. a. Model $a + 4 = 5$.
b. Solve the equation by inspection. (Find the value that makes the equation true.)
c. Verify the solution. (Check to see if the equation is true for this value of the variable.)
 2. a. Model $b - 2 = -5$.
b. Solve the equation by inspection.
c. Verify the solution.
 3. a. Model $2c = -6$.
b. Solve the equation by inspection.
c. Verify the solution.
 4. a. Model $3d = 9$.
b. Solve the equation by inspection.
c. Verify the solution.
4. b. By inspection you can see that $d = 3$.

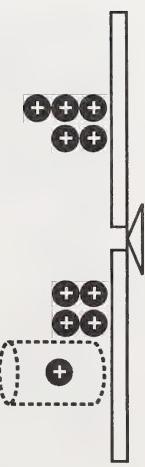
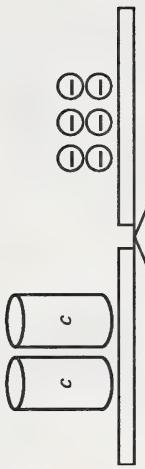
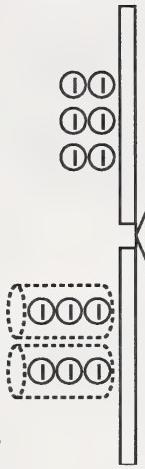
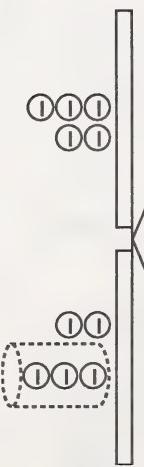
Suggested Activities

Modelling and verifying is shown on pages 53 to 55.

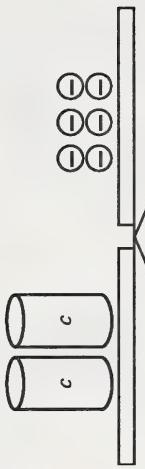
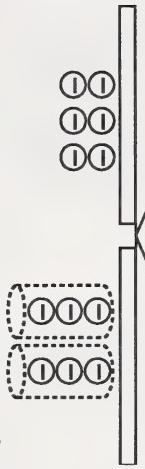
1. b. By inspection you can see that $a = 1$.

5. a. Model $2m + 1 = 7$.
b. Solve the equation by inspection.
c. Verify the solution.
6. a. Model $3x - 1 = 2$.
b. Solve the equation by inspection.
c. Verify the solution.
7. a. Model $3x - 8 = 16$.
b. Solve the equation by using the guess-check-revise method.
c. Verify the solution.
8. a. Model $4x = 2x + 6$.
b. Solve the equation by using the guess-check-revise method.
c. Verify the solution.
5. b. By inspection you can see that $m = +3$.
6. b. By inspection you can see that $x = +1$.
7. b. By using the guess-check-revise method, you will find that $x = 8$.
8. b. By using the guess-check-revise method, you will find that $x = 3$.

9. a. Model $8 + 3x = 7x$.
- b. Solve the equation by using the guess-check-revise method.
- c. Verify the solution.
10. a. Model $4(n + 3) = 20$.
- b. Solve the equation by using the guess-check-revise method.
- c. Verify the solution.
11. a. Model $2x - 3 = 2 + 3x$.
- b. Solve the equation by using the guess-check-revise method.
- c. Verify the solution.
10. b. By the guess-check-revise method $x = 2$.
11. b. By the guess-check-revise method $x = -5$.

Modelling1. a. Model $a + 4 = 5$.c. Verify $a = 1$.3. a. Model $2c = -6$.c. Verify $c = -3$.2. a. Model $b - 2 = -5$.c. Verify $b = -3$.

$$\text{LS} = \text{RS}$$

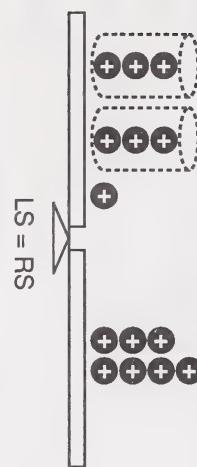
3. a. Model $2c = -6$.c. Verify $c = -3$.4. a. Model $3d = 9$.c. Verify $d = 3$.

$$\text{LS} = \text{RS}$$

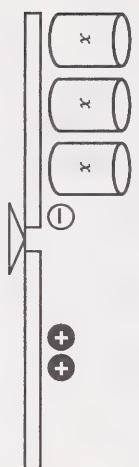
5. a. Model $2m + 1 = 7$.



c. Verify $m = 3$.

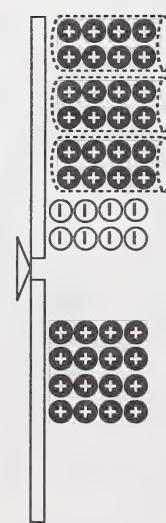


6. a. Model $3x - 1 = 2$.

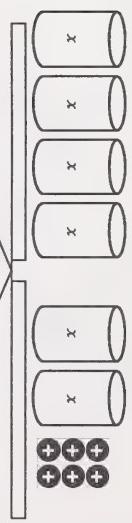


$\text{LS} = \text{RS}$

c. Verify $x = +8$.

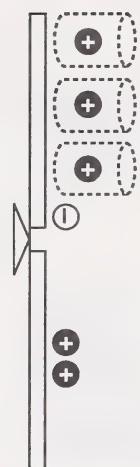


8. a. Model $4x = 2x + 6$.



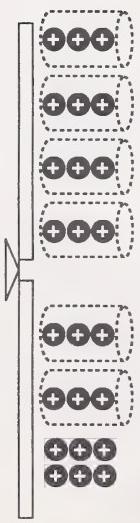
$\text{LS} = \text{RS}$

c. Verify $x = +1$.



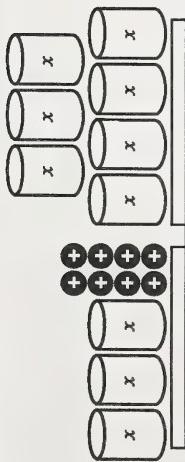
$\text{LS} = \text{RS}$

c. Verify $x = 3$.

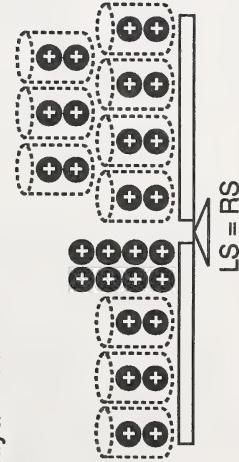


$\text{LS} = \text{RS}$

9. a. Model $8 + 3x = 7x$.

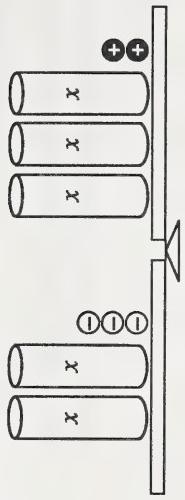


c. Verify $x = 2$.

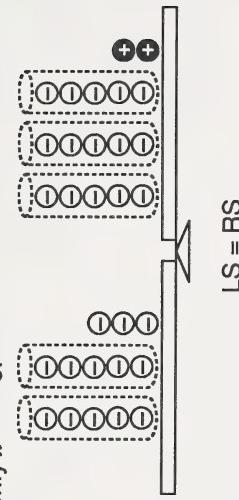


$\text{LS} = \text{RS}$

11. a. Model $2x - 3 = 2 + 3x$.



c. Verify $x = -5$.

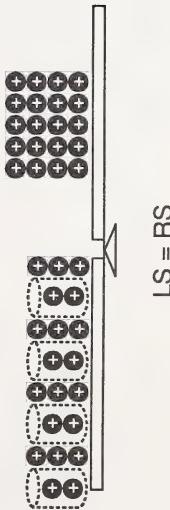


$\text{LS} = \text{RS}$

10. a. Model $4(n + 3) = 20$.



c. Verify $n = 2$.



$\text{LS} = \text{RS}$

Practice Activities

Solve the following equations by using inspection or guess-check-revise methods. Do not use models.

Suggested Answers

1. $n + 8 = 12$ 1. $n = 4$
2. $p - 5 = -5$ 2. $p = 0$
3. $4b = -4$ 3. $b = -1$
4. $6 + x = 3$ 4. $x = -3$
5. $3w + 8 = 5$ 5. $w = -1$
6. $4t - 1 = 7$ 6. $t = 2$
7. $5x + 4 = 4x + 10$ 7. $x = 6$
8. $2(a - 7) = 4$ 8. $a = 9$

Concluding Activities

Solve the following equations by using inspection or guess-check-revise methods. Do not use models.

1. $\frac{a}{3} = 5$

2. $\frac{b}{4} = 20$

3. $\frac{30}{c} = 6$

4. $\frac{r}{15} = \frac{1}{5}$

5. $\frac{10}{t} = \frac{2}{3}$

Suggested Answers

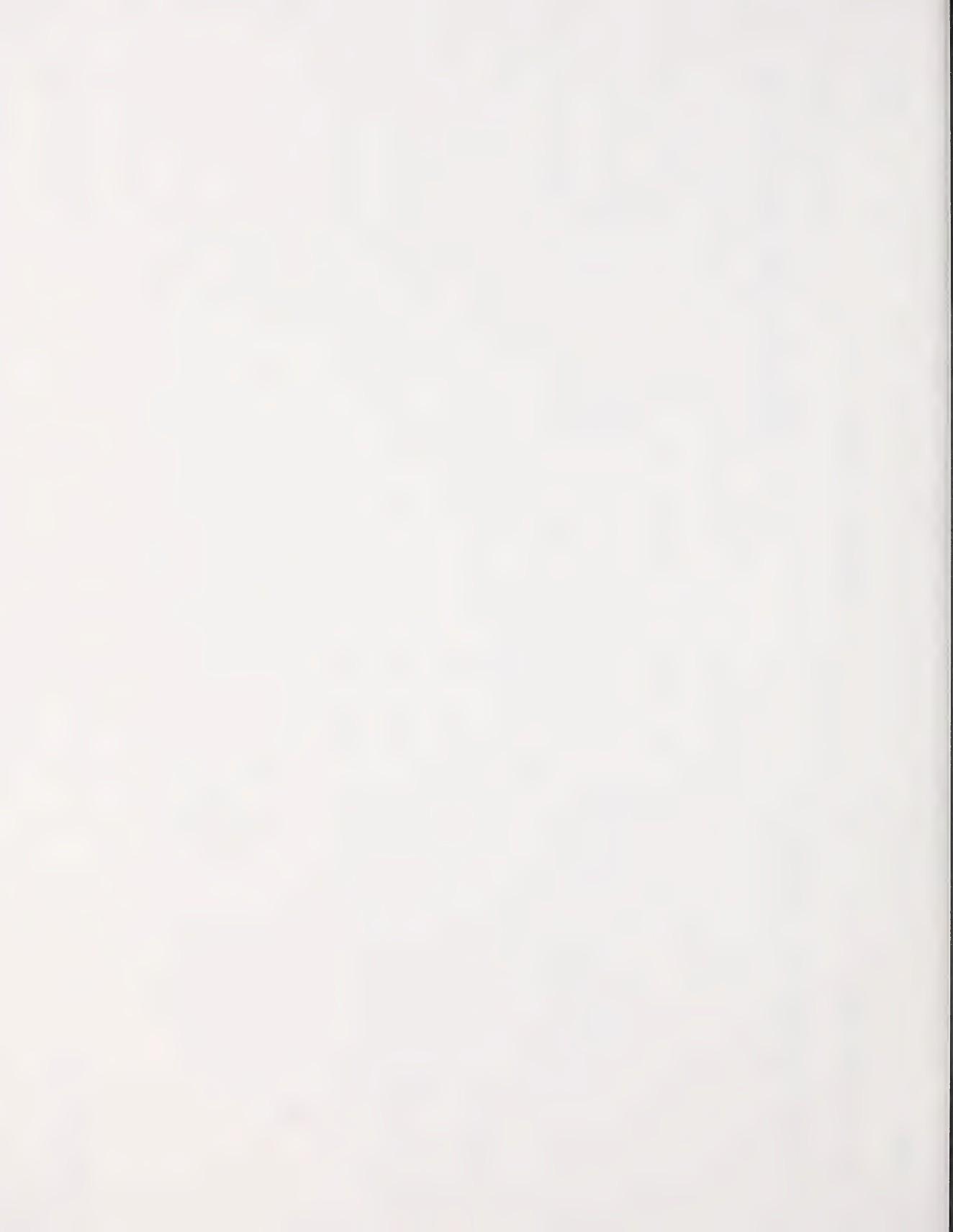
1. $a = 15$

2. $b = 80$

3. $c = 5$

4. $r = 3$

5. $t = 15$



SOLVING EQUATIONS USING ADDITIVE INVERSES

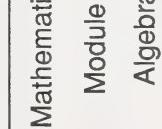
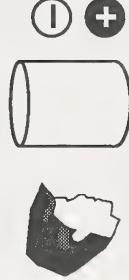
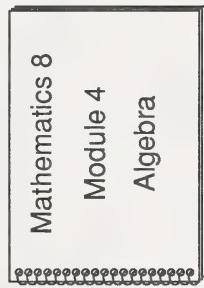
What Lies Ahead

In this section the student will learn these skills.

- using learning aids and additive inverses to solve equations
- using a paper and pencil method and additive inverses to solve equations

Gathering Materials

For this section the student will need these items.



*MATH MOVES: Equations—Solving
With One Step (ACCESS)*
(optional)

Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students decide what to do in this section.

- Help the students to check their answers to the activities in this section and correct any errors.

Introductory Activities

Model these equations and solve the equations by isolating the variable. Be sure to verify your solutions.

Suggested Answers

Modelling and verifying is shown on the next page.

1. $n + 7 = 9$

1. $n = +2$

2. $b - 2 = 6$

2. $b = +8$

3. $y - 1 = 1$

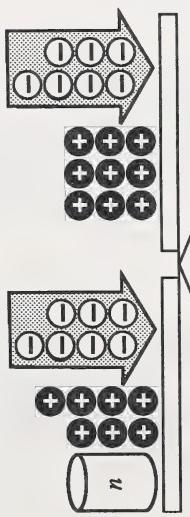
3. $y = +2$

4. $q - 4 = -7$

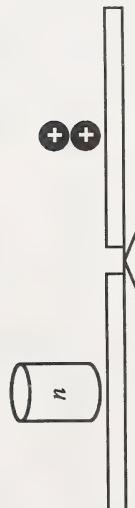
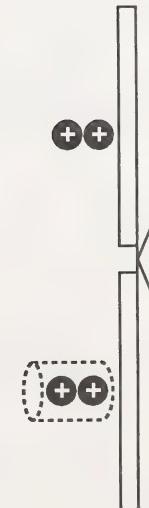
4. $q = -3$

5. $7 = m - 5$

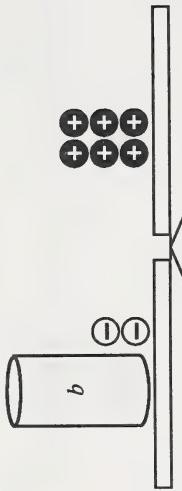
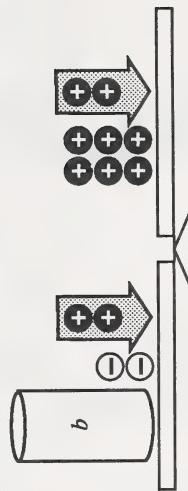
5. $m = +12$

Modelling1. Model $n + 7 = 9$.Add -7 to each side.

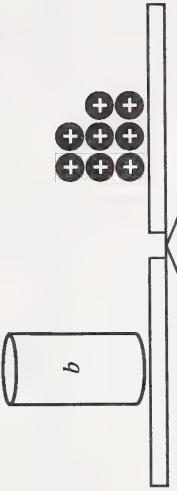
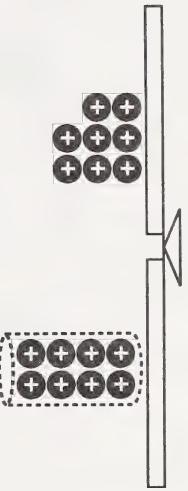
Remove the zero pairs.

Verify $n = +2$.

$$\text{LS} = \text{RS}$$

2. Model $b - 2 = 6$.Add $+2$ to each side.

Remove the zero pairs.

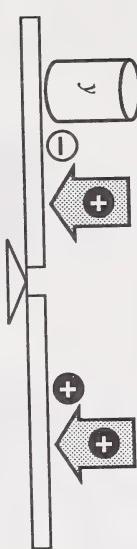
Verify $b = +8$.

$$\text{LS} = \text{RS}$$

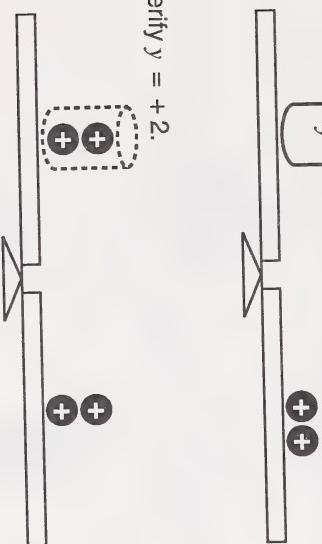
3. Model $y - 1 = 1$.



Add +1 to each side.

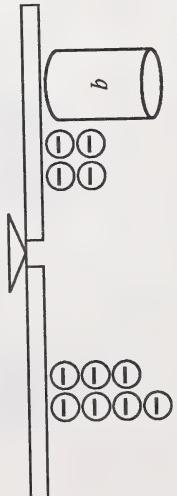


Remove the zero pairs.

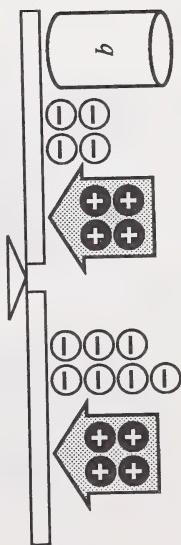


$LS = RS$

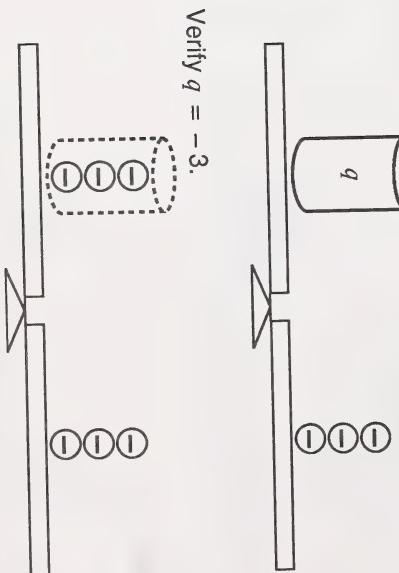
4. Model $q - 4 = -7$.



Add +4 to each side.



Remove the zero pairs.



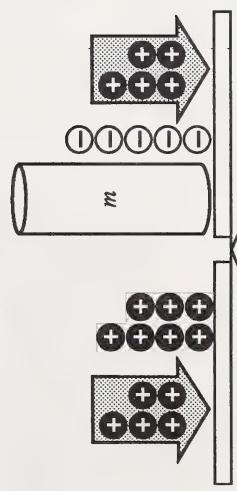
Verify $q = -3$.

$LS = RS$

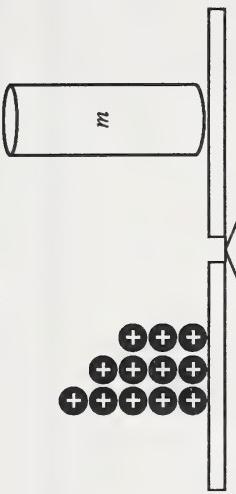
5. Model $7 = m - 5$.



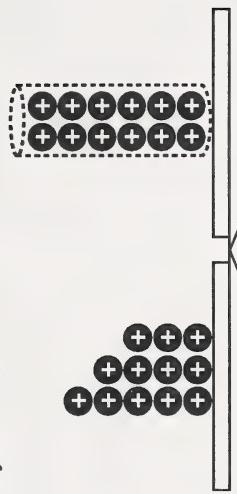
Add +5 to each side.



Remove the zero pairs.



Verify $m = 12$.



$$\text{LS} = \text{RS}$$

Practice Activities

1. What numbers should be added to both sides to isolate the variable?

- a. $x + 2 = 7$
b. $s + 4 = 9$
c. $m + 9 = -13$
d. $t - 5 = 7$
e. $y - 2 = -8$

Suggested Answers

1. a. -2
b. -4
c. -9
d. $+5$
e. $+2$

2. Solve the equations in Question 1 using paper and pencil methods. Verify your solutions.

2. a. $x = 5$
b. $s = 5$
c. $m = 4$
d. $t = 12$
e. $y = -6$

Extra Practice**Suggested Answers**

Use flow charts and inverse flow charts to solve these equations.

$$1. \ s - 3 = 5$$

$$1. \ s = 8$$

$$2. \ k + 12 = 39$$

$$2. \ k = 27$$

$$3. \ 2 + m = 8$$

$$3. \ m = 6$$

$$4. \ s - 4 = 3$$

$$4. \ s = 7$$

Concluding Activities

Solve these equations using a paper and pencil method. Verify your solutions.

1. $x + 225 = 5$

1. $x = -220$

2. $n - 8.5 = 12.3$

2. $n = 20.8$

3. $q - \frac{1}{2} = \frac{3}{4}$

3. $q = 1\frac{1}{4}$

4. $p + 7.5 = 8.2$

4. $p = 0.7$

5. $m - 5\frac{3}{4} = 3\frac{1}{4}$

5. $m = 9$

6. $s - 383 = 117$

6. $s = 500$

Suggested Answers

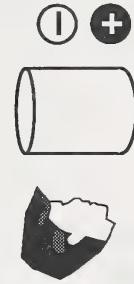
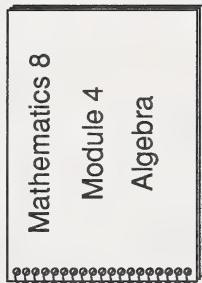
SOLVING EQUATIONS USING MULTIPLICATIVE INVERSES

What Lies Ahead

- In this section the student will learn these skills.
- using learning aids and multiplicative inverses to solve equations
 - using paper and pencil methods and multiplicative inverses to solve equations

Gathering Materials

For this section the student will need these items.



*MATH MOVES: Equations—Solving
With One Step (ACCESS)*
(optional)

Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students decide what to do in this section.

- Help the students to check their answers to the activities in this section and correct any errors.

Introductory Activities

Model these equations and solve the equations by isolating the variable. Be sure to verify your solutions.

Suggested Answers

Modelling is shown on the next page.

1. $2y = 6$

1. $y = 3$

2. $2x = 6$

2. $x = 3$

3. $2t = -2$

3. $t = -1$

4. $3w = 12$

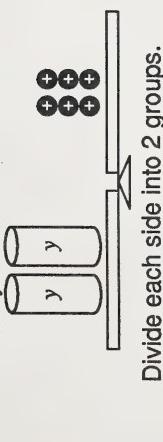
4. $w = 4$

5. $10 = 5t$

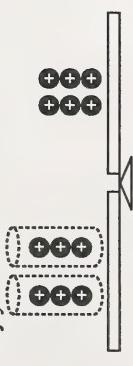
5. $t = 2$

Modelling

1. Model
- $2y = 6$
- .



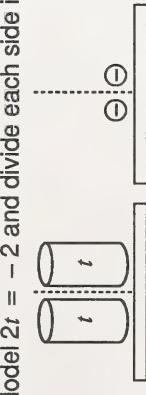
Verify $y = 3$.



$LS = RS$

2. Model
- $2x = 6$
- the same way as you did
- $2y = 6$
- in Question 1.

3. Model
- $2t = -2$
- and divide each side into 2 groups.

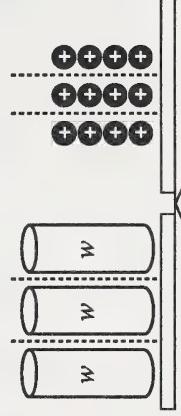


Verify $t = -1$.

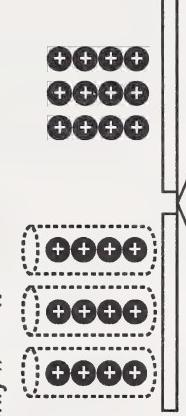


$LS = RS$

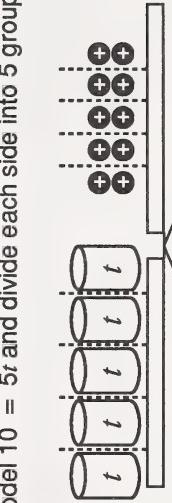
4. Model
- $3w = 12$
- and divide each side into 3 groups.



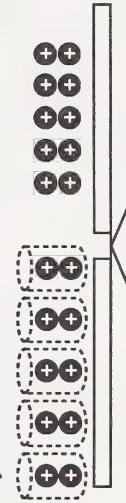
Verify $w = 4$.



5. Model
- $10 = 5t$
- and divide each side into 5 groups.



Verify $t = 2$.



$LS = RS$

Practice Activities**Suggested Answers**

1. What number should both sides be divided by to isolate the variable?

a. $2y = 18$

1. a. 2

b. $4v = 32$

b. 4

c. $3m = -9$

c. 3

d. $-2f = -4$

d. -2

e. $5y = -10$

e. 5

2. Solve the equations in Question 1 by using paper and pencil methods. Verify your solutions.

2. a. $y = 9$
b. $v = 8$

c. $m = -3$

d. $f = 2$

e. $y = -2$

Extra Practice**Suggested Answers**

Use flow charts and inverse flow charts to solve these equations.

1. $9t = -72$

1. $t = -8$

2. $3t = 30$

2. $t = 10$

3. $44 = 4n$

3. $n = 11$

4. $-10 = 2w$

4. $w = -5$

Concluding Activities

Solve the equations using a paper and pencil method. Verify the solutions.

Suggested Answers

1. $4t = 6$ $t = 1\frac{1}{2}$

2. $3a = \frac{1}{2}$ $a = \frac{1}{6}$

3. $2r = \frac{3}{4}$ $r = \frac{3}{8}$

4. $2p = 14.4$ $p = 7.2$

5. $3m = 0.9$ $m = 0.3$

SOLVING MORE EQUATIONS USING MULTIPLICATIVE INVERSES

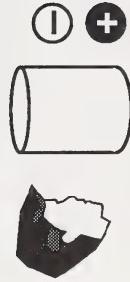
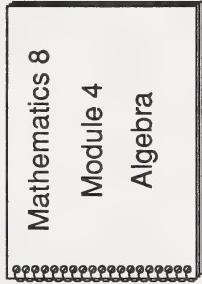
What Lies Ahead

In this section the student will learn these skills.

- using learning aids and multiplicative inverses to solve more equations
- using paper and pencil methods and multiplicative inverses to solve more equations
- using clearing-denominator methods and cross-product methods to solve equations

Gathering Materials

For this section the student will need these items.



Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students decide what to do in this section.
- Help the students to check their answers to the activities in this section and correct any errors.

Introductory Activities

1. Solve the following equations by using models. Be sure to verify each solution.
 - a. $\frac{n}{5} = 6$
 - b. $\frac{q}{11} = 3$
 - c. $\frac{r}{2} = -12$
 - d. $\frac{p}{8} = 2$
 - e. $\frac{b}{7} = -1$
2. Solve the equations in Question 1 using paper and pencil methods.

Suggested Answers

1. Modelling and verifying is shown on the next page.
 - a. $n = 30$
 - b. $q = 33$
 - c. $r = -24$
 - d. $p = 16$
 - e. $b = -7$
2. The answers will be the same as those found in Question 1.

Modelling

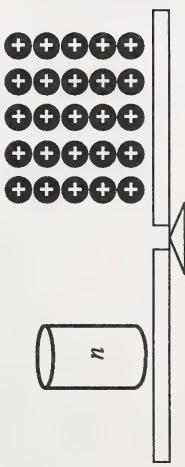
a. Model $\frac{n}{5} = 6$.



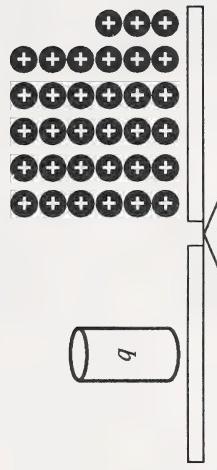
b. Model $\frac{q}{11} = 3$.



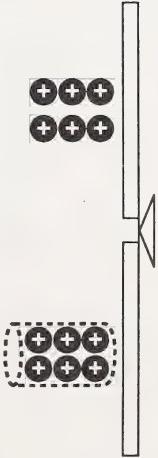
Multiply each side by 5, and replace five $\frac{n}{5}$ with n .



Multiply each side by 11, and replace eleven $\frac{q}{11}$ with q .



Verify $n = 30$ and $\frac{n}{5} = 6$.



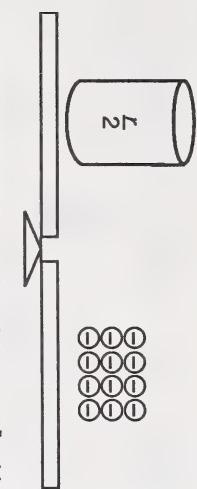
Verify $q = 33$ and $\frac{q}{11} = 3$.



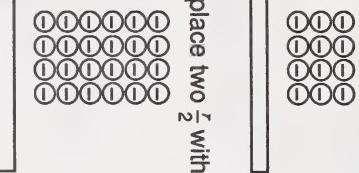
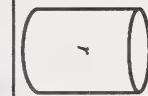
$$\text{LS} = \text{RS}$$

$$\text{LS} = \text{RS}$$

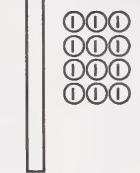
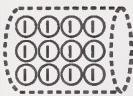
- c. Model $\frac{r}{2} = -12$.



Multiply each side by 2, and replace two $\frac{r}{2}$ with r .



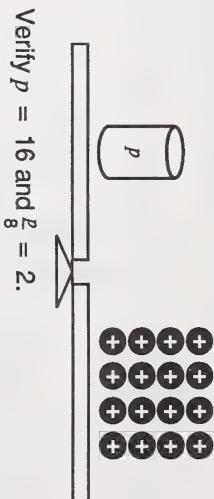
Verify $r = -24$ and $\frac{r}{2} = -12$.



- d. Model $\frac{p}{8} = 2$.

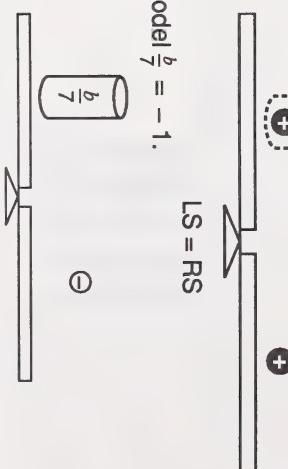


Multiply each side by 8, and replace eight $\frac{p}{8}$ by p .

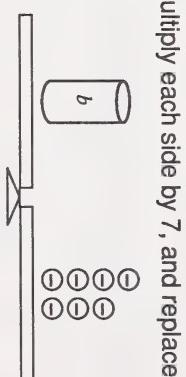
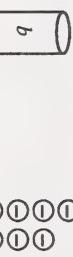


Verify $p = 16$ and $\frac{p}{8} = 2$.

- e. Model $\frac{b}{7} = -1$.



Multiply each side by 7, and replace seven $\frac{b}{7}$ with b .



Verify $b = -7$ and $\frac{b}{7} = -1$.

$LS = RS$

Practice Activities**Suggested Answers**

1. What number should both sides of the equation be multiplied by to isolate the variable?

a. $\frac{n}{15} = \frac{2}{3}$

b. $\frac{f}{9} = \frac{8}{3}$

c. $\frac{y}{5} = \frac{30}{36}$

d. $\frac{r}{7} = \frac{5}{8}$

e. $\frac{3}{4} = \frac{c}{20}$

2. Solve the equations in Question 1. Verify your solutions.

2. a. $n = 10$

b. $f = 24$

c. $y = 4\frac{1}{6}$

d. $r = 4\frac{3}{8}$

e. $c = 15$

Suggested Answers

Use flow charts and inverse flow charts to solve these equations.

1. $\frac{a}{3} = 2$

2. $\frac{b}{4} = 16$

2. $b = 64$

3. $\frac{c}{2} = \frac{3}{4}$

3. $c = 1\frac{1}{2}$

4. $\frac{d}{5} = \frac{8}{25}$

4. $c = 1\frac{3}{5}$

Concluding Activities**Suggested Answers**

Solve the following equations by clearing the denominators or by using cross products. Be sure to verify your solutions.

1. $\frac{h}{7} = \frac{5}{2}$

1. $h = 17\frac{1}{2}$

2. $\frac{5}{t} = \frac{9}{8}$

2. $t = 4\frac{4}{9}$

3. $\frac{n}{2} = \frac{1}{4}$

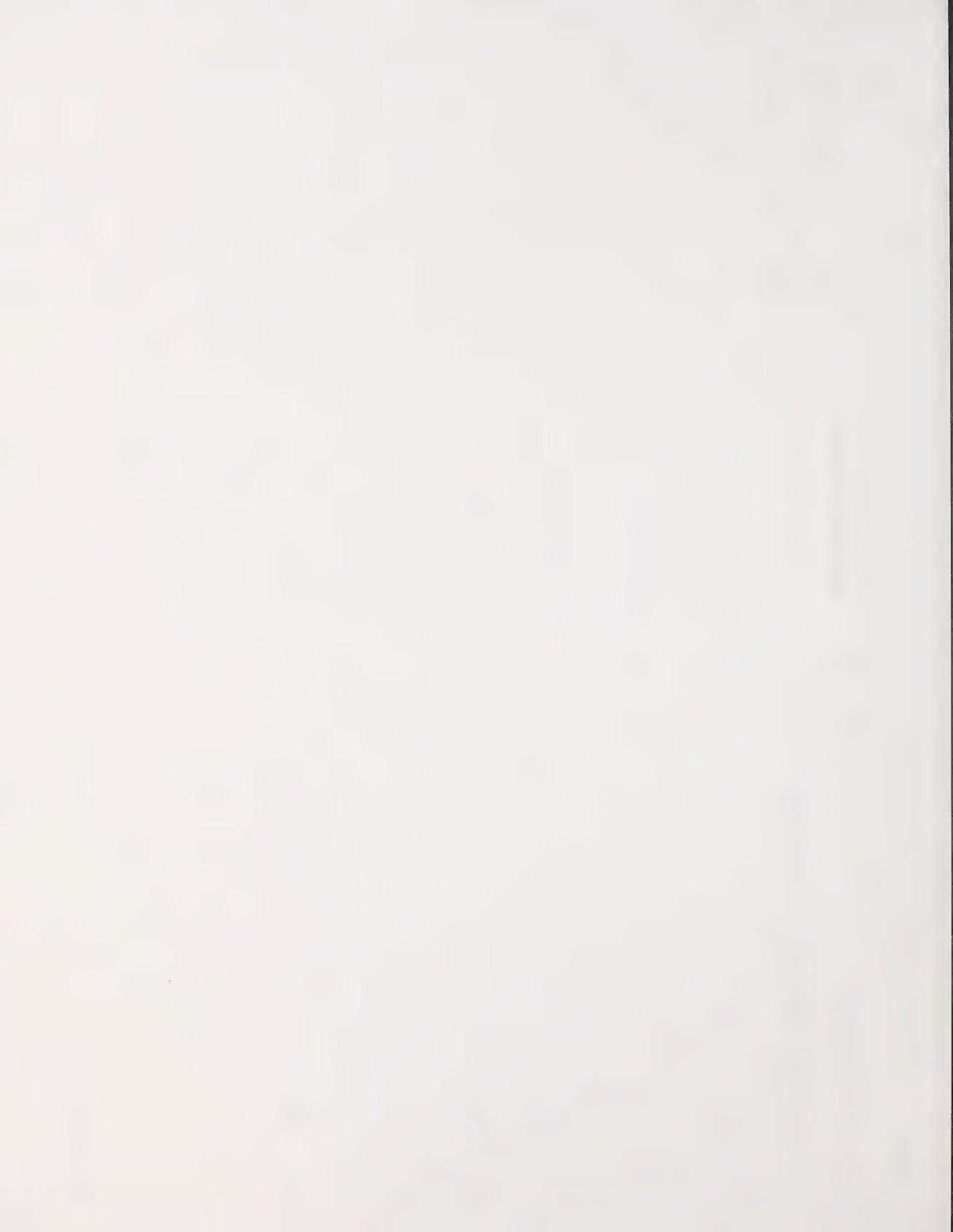
3. $n = \frac{1}{2}$

4. $\frac{4}{m} = \frac{1}{3}$

4. $m = 12$

5. $\frac{\psi}{6} = \frac{1}{3}$

5. $\psi = 2$



SOLVING EQUATIONS USING ADDITIVE AND MULTIPLICATIVE INVERSES

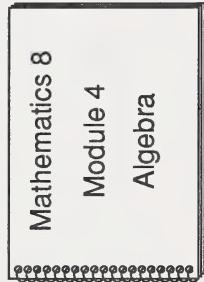
What Lies Ahead

In this section the student will learn these skills.

- solving more complex equations using learning aids
- solving more complex equations using a procedure with paper and pencil

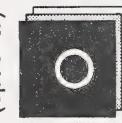
Gathering Materials

For this section the student will need these items.



*MATH MOVES: Equations—Solving
With More Than One Step (ACCESS)*

Computer Drill and Instruction:
Mathematics, Level D (SRA)



Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students decide what to do in this section.

- Help the students to check their answers to the activities in this section and correct any errors.

Introductory Activities

Model these equations by isolating the variable. Be sure to verify your solutions.

Suggested Answers

Modelling is shown on the next page.

1. $3q - 3 = 6$

1. $q = +3$

2. $3y + 4 = 13$

2. $y = +3$

3. $2b + 6 = 12$

3. $b = +3$

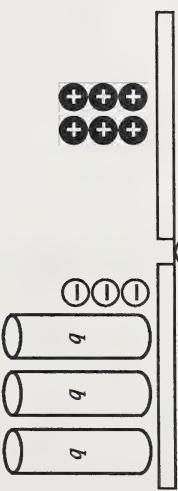
4. $p + 3p = 8$

4. $p = +2$

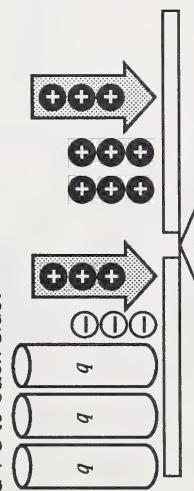
5. $5k - 2k = 6$

5. $k = +2$

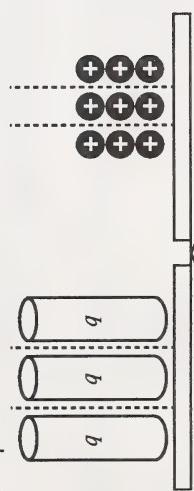
1. Model $3q - 3 = 6$.



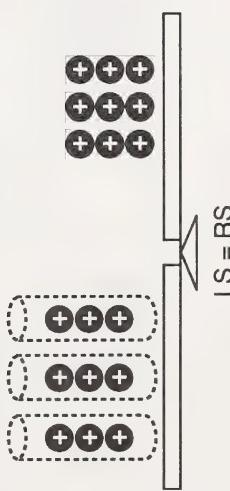
Add $+3$ to each side.



Remove the zero pairs and then divide each side into 3 groups.



Verify $q = +3$.

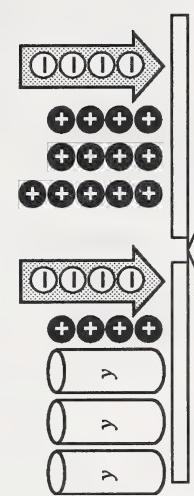


$LS = RS$

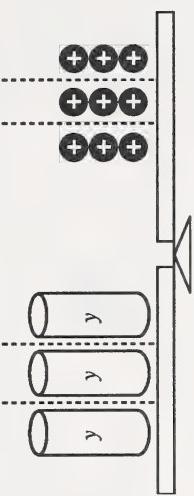
2. Model $3y + 4 = 13$.



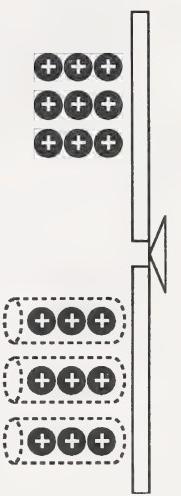
Add -4 to each side.



Remove the zero pairs and divide each side into 3 groups.



Verify $y = +3$.



$LS = RS$

3. Model $2b + 6 = 12$.

Add -6 to each side.

Verify $p = +2$.

4. Model $p + 3p = 8$ and divide each side into 4 groups.

$$\text{LS} = \text{RS}$$

5. Model $5k - 2k = 6$.

Remove the zero pairs and divide each side into 3 groups.

Verify $b = +3$.

Verify $k = +2$ and $-k = -2$.

$$\text{LS} = \text{RS}$$

Practice Activities**Computer Alternative**

1. Do Lesson 8 and Lesson 10 on the disk *Pre-Algebra* from the package *Computer Drill and Instruction: Mathematics, Level D* (SRA).

Print Alternative

2. Solve the equations by using a paper and pencil method. Be sure to verify your solutions.



- a. $5x + 6 = 31$
 - b. $6x - 3 = 15$
 - c. $8a + 6 = 22$
 - d. $3c - 3 = -24$
 - e. $11n + 44 = 0$
1. Computer corrected

3. Solve the following conditions. Place the letter that goes with each condition below the solution in the boxes below.

A $8y - 5y = 30$

L $4a + 2a + 3a = 18$

V $3x + 5x - 2x = 36$

T $9b - 4b + 2b = 77$

E $10c + 4c - 6c = 64$

H $4m + 3m = 84$

O $8x + 2x - 2 = 28$

I $12y - 11y = 8 - 3$

M $-10a + 5a + 7 - 5 = -33$

5	4	2	3	6	8	9	7	10	11	12
I		L	O	V	E		M	A	T	H

3. $y = 10$

$a = 2$

$x = 6$

$b = 11$

$c = 8$

$m = 12$

$x = 3$

$y = 5$

$a = 7$

Extra Practice**Suggested Answers**

Solve the following equations using flow charts and inverse flow charts. Use your calculator to help you if you wish.

1. $3a - 2 = 7$

1. $a = 3$

2. $2b + 1 = -9$

2. $b = -5$

3. $3c - 4 = 5$

3. $c = 3$

4. $4b - 1 = -9$

4. $b = -2$

5. $2d + 1 = 5$

5. $d = 2$

Suggested Answers

Solve the following equations by using additive and multiplicative inverses. Verify the solutions.

$$1. \quad 2a + \frac{1}{2} = \frac{3}{4}$$

$$1. \quad a = \frac{1}{8}$$

$$2. \quad 3b - 1 = 8.3$$

$$2. \quad b = 3.1$$

$$3. \quad 5c + 1.5 = -10$$

$$3. \quad c = 2.3$$

$$4. \quad 2.5 = 1 + 3d$$

$$4. \quad d = 0.5$$

$$5. \quad t + 1 + 3t = 9$$

$$5. \quad t = 2$$

EQUATIONS WITH TWO VARIABLES

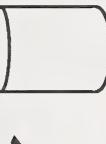
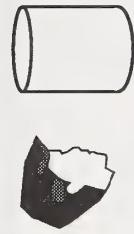
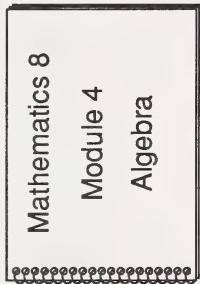
What Lies Ahead

In this section the student will learn these skills.

- modelling equations with two variables
- making a table of values for equations with two variables
- graphing equations

Gathering Materials

For this section the student will need these items.



Guiding the Student

Emphasize to the students the goal of this section.

- Help the students decide what to do in this section.

- Help the students check their answers to the activities in this section and correct any errors.

Introductory Activities

For each of the equations do the following.

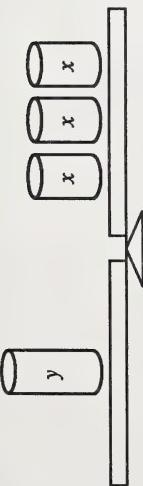
- Use inspection or guess-check-revise methods to find three solutions.
- Write the solutions as ordered pairs.
- Verify the solutions with models.

Models are shown on the next page.

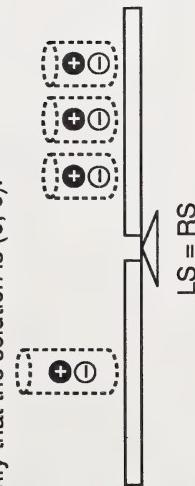
1. $y = 3x$
 1. $(0, 0), (1, 3), (2, 6), (3, 9), (4, 12), \dots$
 2. $y = x - 1$
 1. $(0, -1), (1, 0), (2, 1), (3, 2), (4, 3), \dots$
 2. $y = 2x + 1$
 1. $(0, 1), (1, 3), (2, 5), (3, 7), (4, 9), \dots$

Suggested Answers

1. Model $y = 3x$.

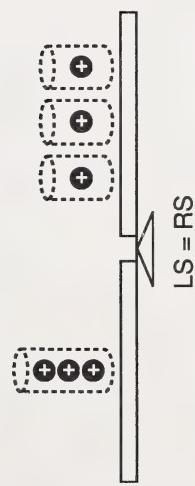


Verify that the solution is $(0, 0)$.



$$\text{LS} = \text{RS}$$

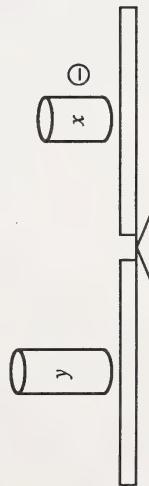
Verify that the solution is $(1, 3)$.



$$\text{LS} = \text{RS}$$

The other ordered pairs are verified in a similar manner.

2. Model $y = x - 1$.



Practice Activities

1. Complete the following tables of values.

a.

$y = 2x$	
x	y
-3	
0	
3	
6	

b.

$y = 3x + 1$	
x	y
-8	
-4	
0	
4	

- 1.

a.

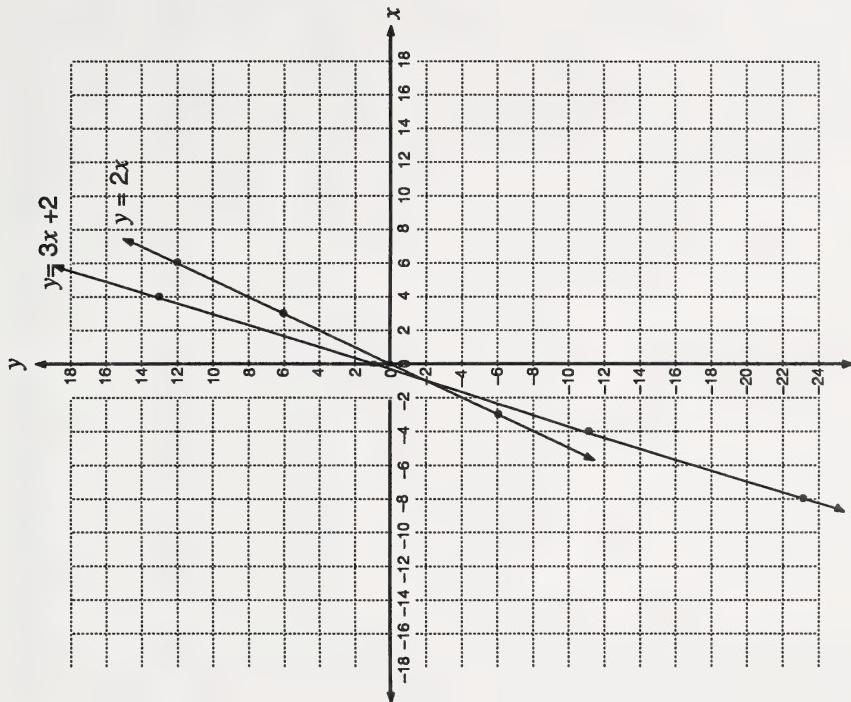
$y = 2x$	
x	y
-3	-6
0	0
3	6
6	12

b.

$y = 3x + 1$	
x	y
-8	-23
-4	-11
0	1
4	13

Suggested Answers

2. Graph the equations from Question 1.



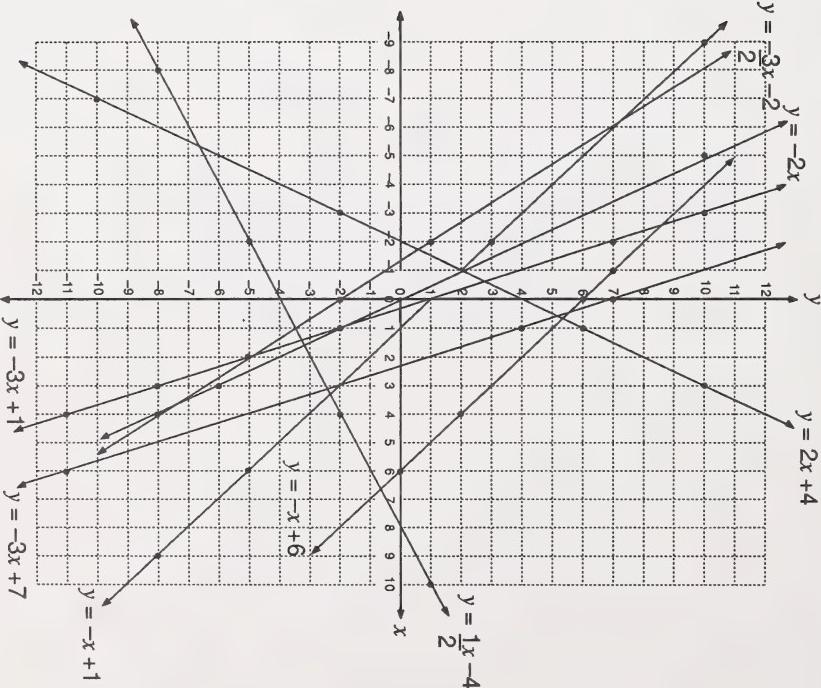
Concluding Activities

Suggested Answers

1. Find the answer to the riddle by completing the worksheet on the following page.¹

2. Graph each of the equations from Question 1 on the grid at the right.

3. What do you notice about the graphs of all the equations in Question 1?



3. All the graphs are of straight lines. The graphs of equations with positive coefficients slant from top right to bottom left. The graphs of equations with negative coefficients slant from top left to bottom right.

¹1982 Creative Publications, Sunnyvale, California 94086 for excerpt from *Algebra With Pizzazz*.

WHY DID ZORNA POUR KETCHUP ON HER BROTHER'S HAND?

Complete the table for each equation. Find each answer in the code key and notice the letter next to it. Write this letter in the box at the bottom of the page that contains the circled number in that row of the table.

$$y = -2x$$

x	y
1	-2
4	-8
-5	10
3	-6

$$y = 2x + 4$$

x	y
3	10
-7	-10
1	6
-3	-2

$$y = -3x + 1$$

x	y
3	-8
-3	10
4	-11
-2	7

$$y = \frac{1}{2}x - 4$$

x	y
10	1
-2	-5
4	-2
-8	-8

CODE KEY	
13	L
10	R
7	A
6	T
4	P
3	M
2	W
1	I
0	N
-2	H
-5	D
-6	B
-8	E
-10	O
-11	S

CODE KEY	
13	L
10	R
7	A
6	T
4	P
3	M
2	W
1	I
0	N
-2	H
-5	D
-6	B
-8	E
-10	O
-11	S

CODE KEY	
13	L
10	R
7	A
6	T
4	P
3	M
2	W
1	I
0	N
-2	H
-5	D
-6	B
-8	E
-10	O
-11	S

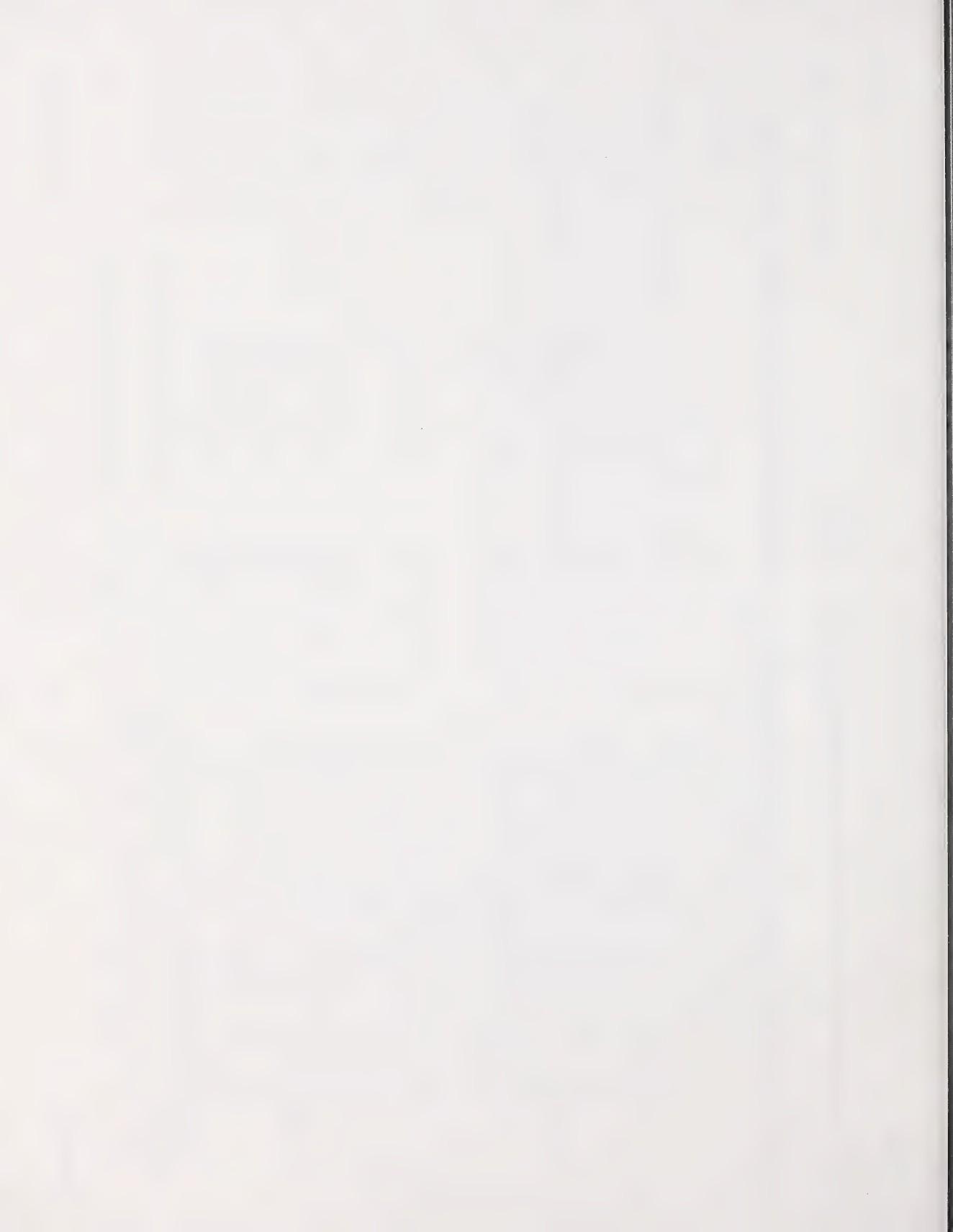
CODE KEY	
13	L
10	R
7	A
6	T
4	P
3	M
2	W
1	I
0	N
-2	H
-5	D
-6	B
-8	E
-10	O
-11	S

CODE KEY	
13	L
10	R
7	A
6	T
4	P
3	M
2	W
1	I
0	N
-2	H
-5	D
-6	B
-8	E
-10	O
-11	S

CODE KEY	
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2	W
1	I
0	N
-2	H
-5	D
-6	B
-8	E
-10	O
-11	S

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
H	E	R	B	R	O	T	H	E	R	S	A	I	D	H	E	W	A	N	T	E	D	H	I	S	P	A	L	M	R	E	D



RELATIONS

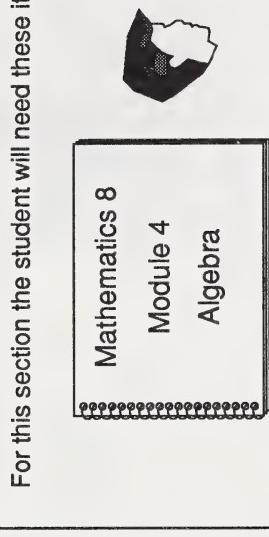
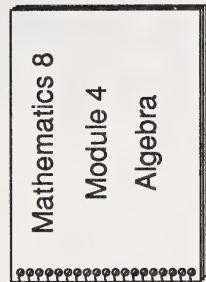
What Lies Ahead

In this section the student will learn these skills.

- describing a relation using a table, a rule, ordered pairs, and a graph
- finding missing terms in a sequence

Gathering Materials

For this section the student will need these items.



- Emphasize to the students the goal of this section.
- Help the students decide what to do in this section.

Guiding the Student

- Help the students check their answers to the activities in this section and correct any errors.

Practice Activities

1. Santini likes to go horseback riding. How is the cost related to the riding time?

**Suggested Answers**

Riding Time In Hours (t)	Relation	Cost In Dollars (c)
1	$4 + 2 \times 1$	6
2	$4 + 2 \times 2$	8
3	$4 + 2 \times 3$	10
4	$4 + 2 \times 4$	12
5	$4 + 2 \times 5$	14

Describe the relationship by using each of the following methods.

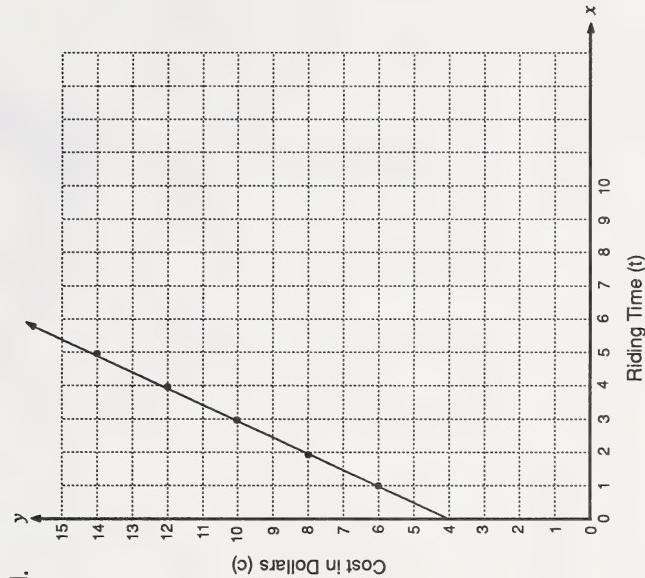
- Write the words to describe the relation.
 - Write an equation to describe the relation.
- Two times the riding time plus four equals the cost.
 - $c = 4 + 2t$

- c. Write ordered pairs to describe the relation.

- c. $(1, 6), (2, 8), (3, 10), (4, 12), (5, 14), \dots$

- d. Describe the relationship using a graph.

d.



2. How is Rajah's hourly pay related to Nadia's hourly pay?



Nadia's Pay (f)	Relation	Rajah's Pay (g)
5	$5 - 1$	4
6	$6 - 1$	5
7	$7 - 1$	6
8	$8 - 1$	7
9	$9 - 1$	8

Describe the relationship several ways by using each of the following methods.

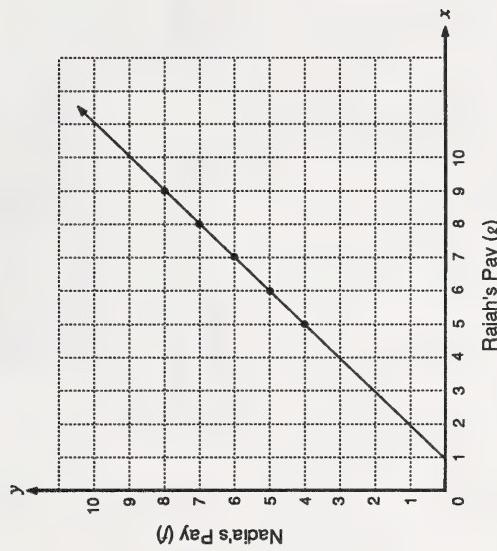
- a. Write words to describe the relation.
 2. a. Nadia's pay minus one dollar is equal to Rajah's pay.
- b. Write an equation to describe the relation.
 - b. $g = f - 1$

- c. Write ordered pairs to describe the relation.

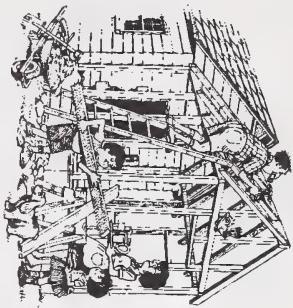
- c. $(5, 4), (6, 5), (7, 6), (8, 7), (9, 8), \dots$

- d. Use a graph to describe the relation.

d.



3. How is the length (in metres) of the new room related to the width (in metres) of the new room?



Width In Metres (w)	Relation	Length In Metres (ℓ)
1	$2 \times 1 + 3$	5
2	$2 \times 2 + 3$	7
3	$2 \times 3 + 3$	9
4	$2 \times 4 + 3$	11
5	$2 \times 5 + 3$	13

Describe the relationship by using each of the following methods.

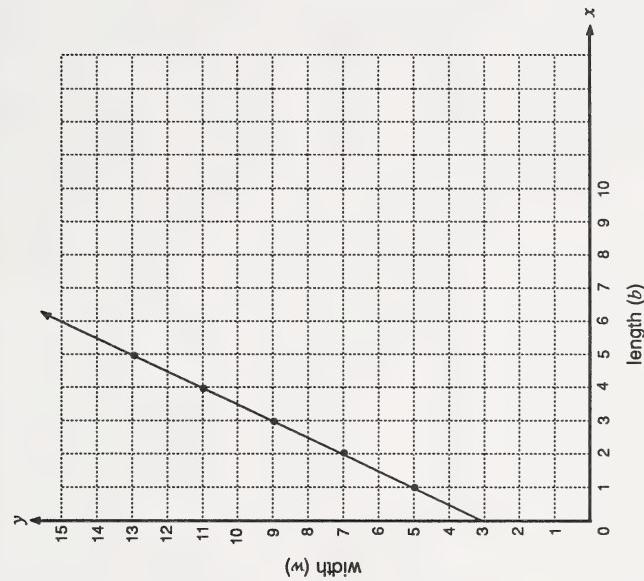
- Describe the relation using words.
- Describe the relation using an equation.
- a. Two times the width plus three metres equals the length.
b. $\ell = 2w + 3$

- c. Describe the relation using ordered pairs.

- c. $(1, 5), (2, 7), (3, 9), (4, 11), (5, 13), \dots$

- d. Describe the relation using a graph.

d.



Concluding Activities

Suggested Answers

1. a. What are the next three terms of the following sequence?

5, 6, 7, 8, , ,

- b. Find the fiftieth term of the above sequence.

Term	Relation	Number
1	$1 + 4$	5
2	$2 + 4$	6
3	$3 + 4$	7
4	$4 + 4$	8

The relation
is $n + 4$.

Evaluate $n + 4$ if $n = 50$.

$$50 + 4 = 54$$

The fiftieth term is 54.

2. a. What are the next three terms of the following sequence?

6, 9, 12, 15, , ,

- b. ... , 18, 21, 24

Term	Relation	Number
1	$(1 + 1) \times 3$	6
2	$(2 + 1) \times 3$	9
3	$(3 + 1) \times 3$	12
4	$(4 + 1) \times 3$	15

The relation
is $(n + 1) \times 3$.

Evaluate $(n + 1) \times 3$ if $n = 50$.

$$(50 + 1) \times 3 = 153$$

The fiftieth term is 153.

3. a. What are the next three terms of the following sequence?

8, 16, 24, 32, 40, ■■■, ■■■

- b. Find the fiftieth term of the above sequence.

3. a. ..., 48, 56, 64

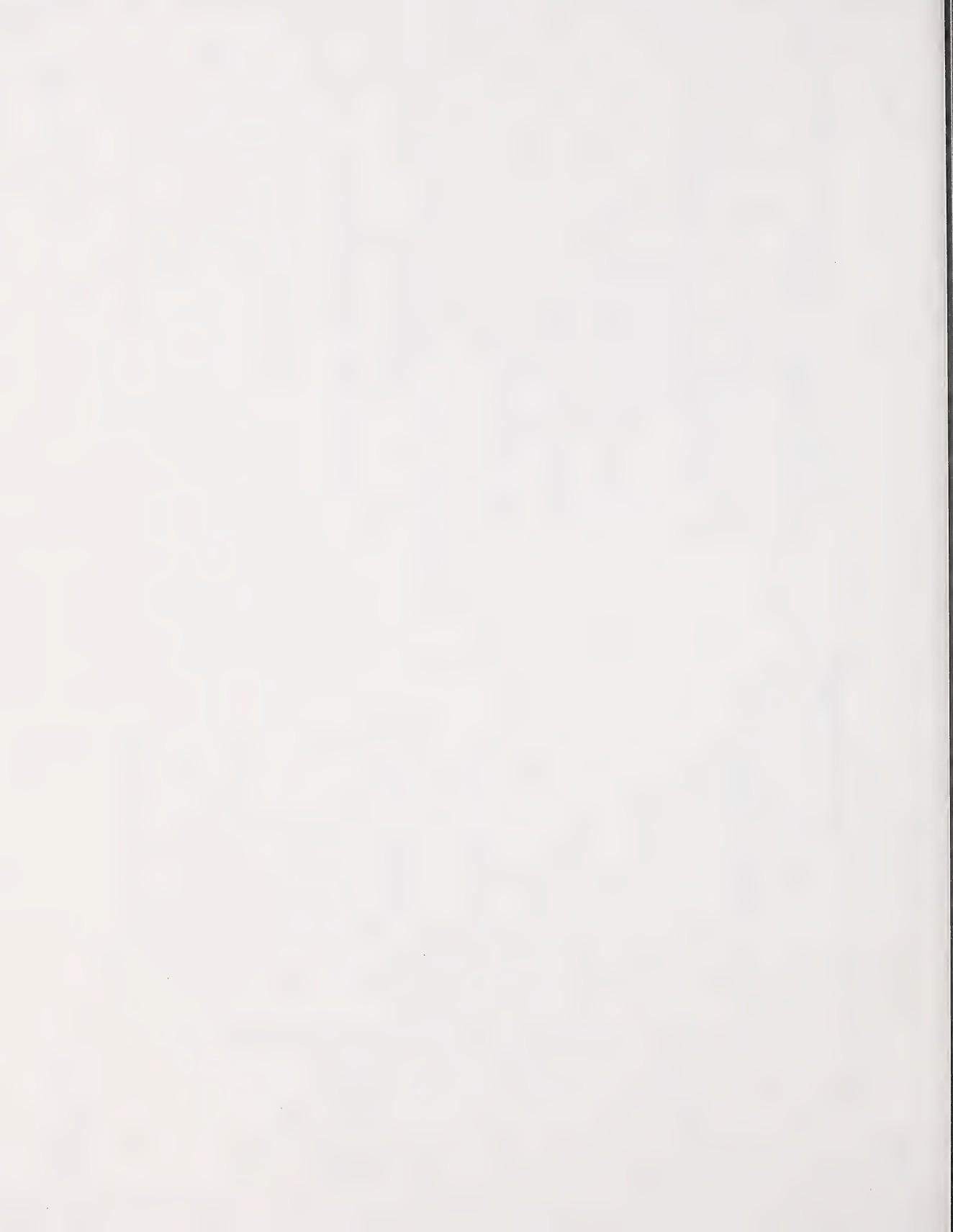
Term	Relation	Number
1	1×8	8
2	2×8	16
3	3×8	24
4	4×8	32
5	5×8	40

The relation
is $n \times 8$.

Evaluate $n \times 8$ if $n = 50$.

$$50 \times 8 = 400$$

The fiftieth term is 400.



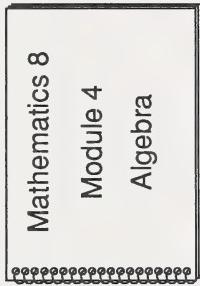
SUMMARY

What Lies Ahead

In this section the student will review the skills learned in Module 4.

Gathering Materials

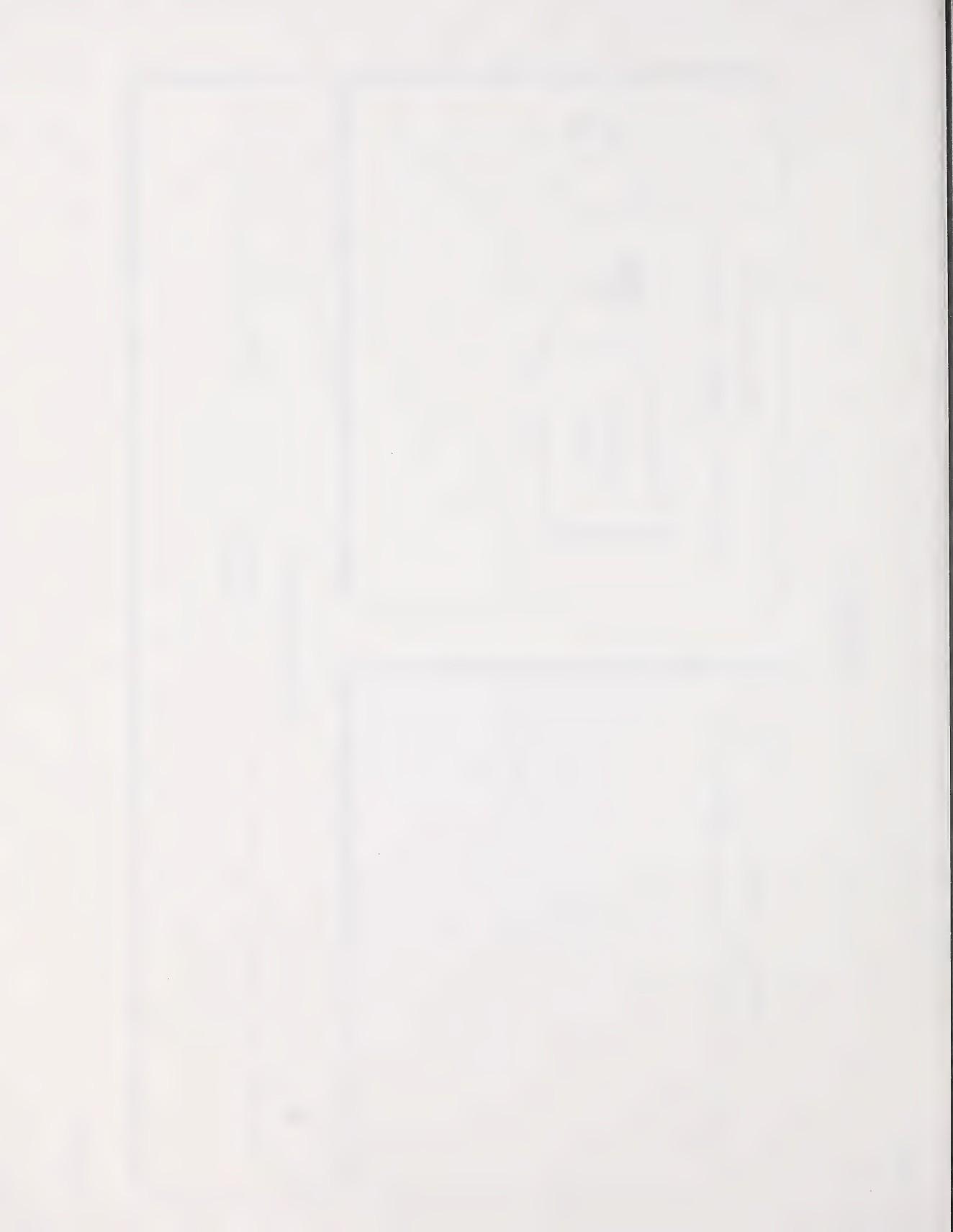
For this section the student will need these items.



Guiding the Student

- Emphasize to the students the goal of this section.

- Help the students check their answers to the pretest in Section 1.



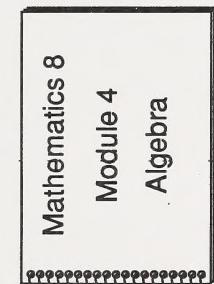
MODULE CONCLUSION

What Lies Ahead

The student is now ready to do the assignment in the Assignment Booklet. The student will be graded on the work done in this booklet.

Gathering Materials

The student will need the following items.



Guiding the Student

- Have the student complete the module assignment independently. The student may use resource material, but cannot get help. The student should attempt all parts of the assignment.

- Afterwards, you should both complete the declaration. You should submit the Assignment Booklet for a grade and feedback.

INCONTRI CON I MIAI

menti di poesia

L'infanzia e i primi anni di vita

versi e saggezze di un poeta che si è fatto gergo
e cultura nel suo paese, in un mondo sempre più
lontano da cui è.

Francesca

Viviana
Giovanni

Francesca
La Storia
Giovanni



Mia sorella Francesca

scriveva a mia madre una volta al mese,
ma oggi non ha più scritto da tre mesi.
Mi dispiace molto.

Immagino che non mi ricorda più
neppure il mio nome, ma comunque
mi ha lasciato un bel ricordo.

Giovanni

Francesca

Francesca

Francesca

Francesca

Francesca

Francesca

Francesca

